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VIRGINIA ACADEMY OF SCIENCE

PROCEEDINGS FOR THE YEAR
1951 - - 1952

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VOL. 3, NEW SERIES No. 4

VIRGINIA ACADEMY OF SCIENCE

Proceedings for the Year 1952 - - 1953

MINUTES OF THE THIRTIETH ANNUAL MEETING

MAY 15, 16, 17, 1952

OLD POINT COMFORT, VIRGINIA

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ARTHUR BEVAN	1946-47
JESSE W. BEAMS	1947-48
SIDNEY S. NEGUS	1948-49
BOYD HARSHBARGER	1949-50
GUY W. HORSLEY	1950-51
PAUL M. PATTERSON	1951-52
LLOYD C. BIRD	1952-53
ALLAN T. GWATHMEY	1953-54

*Deceased

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VIRGINIA JOURNAL OF SCIENCE

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L. W. Jarman	Science Teachers
Walter Hendricks	Statistics

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JEFFERSON MEDAL WINNERS

RECIPIENTS OF THE JEFFERSON GOLD MEDAL[1]

Alfred Chanutin	1936
William B. Porter	1937
H. M. Phillips	1938
G. M. Shear and H. D. Ussery	1939

RECIPIENTS OF THE JEFFERSON PRIZE[2]

L. G. Overholzer and John H. Yoe	1940
Allan T. Gwathmey	1941
R. N. Jefferson	1942
W. H. Hough	1943
Clinton B. Cosby	1944

RECIPIENTS OF J. SHELTON HORSLEY RESEARCH AWARDS

CARL C. SPEIDEL	1927
JOHN H. YOE	1928
J. C. STREET	1929
H. E. JORDAN	
CARL C. SPEIDEL	1930
E. C. STEVENSON	1931
JAMES H. SMITH	1932
S. A. WINGARD	1933
E. P. JOHNSON	1934
MARGARET HESS	1935
ALFRED CHANUTIN	1936
R. G. HENDERSON	1937
S. G. BEDELL	1938
M. J. MURRAY	
F. F. CLEVELAND	1939
WALTON C. GREGORY	1940
CHARLES RAY	1941
NO AWARD	1942

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1 The winning papers in this competition were entered against those of the North Carolina, South Carolina, Georgia and Florida Academies of Science. It was discontinued in 1940.

2 The winning authors had the choice of the Jefferson Prize or the Academy Prize during this period. The name of the Academy Prize was changed to the J. Shelton Horsley Award; and the Jefferson Prize discontinued in 1944.

J. B. MEYER 1943
J. H. TAYLOR 1944
NO AWARD 1945
BOYD HARSHBARGER
D. B. DELURY (separate papers) 1946
NO AWARD 1947
HENRY LEIDHEISER, JR. 1948
WALTER S. FLOYD, JR. 1949
ERLING S. HEGRE 1950
DAVID B. DUNCAN 1951
D. R. H. GOURLEY 1952

General Program of The Thirtieth Annual Meeting 1952

HOTEL CHAMBERLIN—OLD POINT COMFORT

WEDNESDAY, MAY 14

3:00 P. M. to 9:00 P. M.—Registration for Junior Academy Members, participants in the Science Talent Search, Academy members and Guests, Hotel Lobby.
Setting up Exhibits, Sun Porch.

7:30 P. M.—Astronomical Show, Monroe Room.

THURSDAY, MAY 15

8:00 A. M. to 10:00 A. M.—Registration for Academy Members (Junior and Senior) and Guests, Hotel Lobby.
Setting up Exhibits, Sun Porch.

10:30 A. M.—Participants in the Science Talent Search and Science Club Exhibitors meet with John E. Hocutt and Grover W. Everett, Monroe Room.

11:00 A. M. to 3:00 P. M.—Interviews with participants in the Science Talent Search, Monroe Room, John Smith Room, Chesapeake Room and Parlor A.

1:00 P. M. to 2:30 P. M.—Judging of Science Exhibit Contests, Sun Porch.

3:00 P. M.—Meeting of the Talent Search Committee, John Smith Room.

3:30 P. M.—Annual Business Meeting of the Junior Academy of Science, Roof Garden.

Reports of Officers
Election of Officers for 1952-53
Reading of Outstanding Club Reports

3:30 P. M.—Meeting of all Section Officers, Chesapeake Room.

4:00 P. M.—Meeting of the Council of the Senior Academy, Chesapeake Room.

5:00 P. M.—Meeting of Section Editors, Parlor A.

6:00 P. M.—Junior-Senior Get Together, Sun Porch.

6:30 P. M.—Junior Academy Dinner, Virginia Room.

Presiding—Raymond Kirby, *President of the Junior Academy*

Presentation of Junior Academy Awards—Grover W. Everett

Presentation of Virginia Science Talent Search Awards—John E. Hocutt

Address—Dr. William A. Kepner, University of Virginia

Tickets must be obtained at the Registration Desk by noon on Thursday.

8:00 P. M.—Junior Social Hour, Sun Porch.

8:00 P. M.—Academy Conference and General Meeting, Roof Garden.

Reports of Officers

Reports of Committees

Long Range Planning—Marcellus H. Stow, *Chairman*

Research—Walter S. Flory, *Chairman*

Finance and Endowment—Guy W. Horsley, *Chairman*

Junior Academy of Science—Grover W. Everett, *Chairman*

Seventh Virginia Science Talent Search—John E. Hocutt, *Chairman*

Activities for Collegiate Members

—Joe W. Guthridge, *Chairman*

—Robert P. Carroll, *Co-Chairman*

Membership—Foley F. Smith, *Chairman*

James River Project—Marcellus H. Stow, *Chairman*

Resource-Use Education—John Thornton Wood, *Chairman*

Virginia Flora—A. B. Massey, *Chairman*

Virginia Fauna—Jay D. Andrews, *Chairman*

Virginia Journal of Science—Boyd Harshbarger, *Editor-in-Chief*

Science Museum—G. W. Jeffers, *Chairman*

Exchange of Foreign Students—Edgar J. Fisher, *Chairman*

Speakers Bureau—S. S. Obenshain, *Chairman*

Place of Meeting for 1953—Bruce D. Reynolds, *Chairman*

Local Arrangements—William G. Guy, *Chairman*

Report on the National Conference of State Academies
—Foley F. Smith
New Business

FRIDAY, MAY 16

8:00 A. M.—Registration, Hotel Lobby

9:00 A. M.—Section Meetings
Agricultural Sciences, Parlor A
Astronomy, Mathematics and Physics, Monroe Room
Bacteriology, Roof Rotunda
Biology, Roof Garden
Chemistry, Virginia Room
Education, Parlor B
Engineering, Chamberlin Club
Geology, John Smith Room
Medical Sciences, Chesapeake Room
Psychology, Fort Room
Science Teachers, Arena Room
Statistics, Parlor C.

12:30 P. M.—Group Luncheons

2:00 P. M.—Section Meetings

4:00 P. M. to 6:00 P. M.—Academy members to be guests at a reception at the Mariner's Museum

7:00 P. M.—Business Meeting and Guest Speaker.
Presiding—Paul M. Patterson, *President,* Virginia Academy of Science
Welcome—Alvin D. Chandler, *President,* College of William and Mary in Virginia
Presentation of J. Shelton Horsley Research Award
Presentation of Virginia's first National Science Talent Search Winner and her Sponsor
Report of Nominations Committee
Report of Committee on Resolutions
Report of Place-of-Meeting Committee
Installation of Officers for 1952-53

8:30 P. M.—Address Professor E. Newton Harvey, *Princeton University.*
"Bioluminescence"

SATURDAY, MAY 17

9:00 A. M.—Section Meetings

10:00 A. M.—Academy Council Meeting, Parlor A

2:00 P. M.—Field Trips (see bulletin board for further information).

Minutes of The Council Meeting May 15, 1952

A Council meeting was called in the Chesapeake Room, Hotel Chamberlin, at 4 o'clock by President Paul Patterson. Present were; Lloyd C. Bird, I. G. Foster, Boyd Harshbarger, Horton Hobbs, Jr., Guy W. Horsley, Ladley Husted, Marcellus Stow, Foley F. Smith, with President Paul Patterson presiding.

Minutes of the last Council meeting were read and approved. Dr. Harshbarger discussed the change in the By-laws relative to student members, and it was properly moved and passed that a change be made "that $1.25 of the $2.00 student dues go to the Virginia Journal of Science to cover the cost of student subscription." This was inadvertently left out of the publication of this proposed change and was a correction to be presented at the Academy Conference.

President Patterson advised the Council that no one had been found to take over the work of maintaining the records of the future scholastic and professional attainments of Science Talent Search winners. He advised that the State Department of Education could not undertake this project at this time.

Professor Stow, Chairman of the Long-Range Project Committee discussed the project of the Dismal Swamp study and called on Dr. Baldwin to give a progress report on the work of his committee. The project for a complete scientific study of the Swamp jointly with the Richmond Area University Center, covering a five year period had not crystallized, but the committee had decided to prepare a manuscript for a popular science book on the Swamp, as a special project.

Professor Baldwin received the thanks of Council for his work in preparing the presentation of the project to the cooperating institutions.

It was moved and passed that the council recommend to the Academy Conference that a registration fee of fifty cents per Senior member be made at future annual meetings. This money will be used to defray the expenses, if necessary, for the annual guest speaker.

There being no further business the meeting adjourned at 5:45 p. m.

FOLEY F. SMITH, *Secretary.*

Minutes of The Academy Conference

Thursday Evening, May 15, 1952

The Academy Conference convened in the Roof Garden of the Hotel Chamberlin at 8 o'clock. It was called to order by President Paul M. Patterson, when a forum of forty members had assembled.

The President made a report concerning Dr. Victor Tiedjens, who was appointed as councillor to serve for the unexpired term of John N. Buck. However, Mr. Tiedjens left the State, and the President noted that it was necessary for the Nominating Committee to nominate a councillor for one year and a councillor for five years to fill the present vacancies.

He recommended that the Committee on Exchange of Foreign Students be discontinued, as it was felt that the function of this committee was no longer necessary.

It was moved and passed that Edward Harlow and Foley F. Smith be continued as advisors to the Committee on Local Arrangements for the annual meetings.

The proposed Constitutional changes as previously published in the Virginia Journal of Science were brought up for discussion. Section 4 of the By-laws concerning the honorarium of the secretary were changed as proposed. The motion for approval of this change was carried. The proposed change in Section 7 of the By-laws concerning the granting to Council of authority to act in any emergency, but subject to subsequent approval by the Council, was carried after considerable discussion. The vote for this change was 27 in favor of the change and 17 opposed. The change in Section 2 of the By-laws concerning the status of student members, as proposed in the April issue of the Virginia Journal of Science, was passed with the correction inserted in the change; "that $1.25 of the student dues of $2.00 be allocated to the Virginia Journal of Science to cover student subscription."

After some discussion the Conference accepted the Council recommendation that Senior members of the Academy pay a fifty cent registration fee at future annual meetings: this money to be earmarked for the expense of the invited guest speaker at the annual meeting.

The appended reports of the following committees were made and adopted.

Report of the Secretary-Treasurer and Membership Committee.
Report of the Research Committee.
Report of the Finance Committee.
Report of the Junior Academy of Science Committee.
Report of the Science Talent Search Committee.
Report of the Committee on Collegiate activities.

Report of the James River Project Committee.
Report of the Resource-Use Committee.
Report of the Flora Committee.
Report of the Fauna Committee.
Report of the Editor-in-chief Virginia Journal of Science.
No report from the State Science Museum Committee.
Report of the committee on Exchange of Foreign Students.
Report of the Speakers Bureau.
Report of Committee on place of meeting in 1953.
Report on the Academy Conference at the AAAS meeting in Philadelphia.

After several announcements and changes in the Local Arrangements by Dr. W. G. Guy, the Conference adjourned at 10:45 p. m.

FOLEY F. SMITH, *Secretary.*

REPORT OF THE SECRETARY-TREASURER

The report of the auditor covering the accounts and the finances of the Academy for the past year is included in the Committe reports, and the Finance Committee has studied this report.

The Academy has enjoyed a good year, and has witnessed particularly outstanding work by the Junior Academy of Science Committee, and the Science Talent Search Committee. The Chairmen of these two committees are to be congratulated for their very active work. John Hocutt, Chairman of the Science Talent Search Committee, personally raised some $1300 from various industrial organizations to help defray the expenses of the Talent Search winners to the annual meeting. Grover Everett, of Lynchburg College, Chairman of the Junior Academy of Science Committee has done outstanding work of rejuvenating the important activities of this Committee. Detailed reports of these and other Committees will follow.

The Academy was represented at two Council Meetings of the AAAS, in Philadelphia, December 26-31, 1951, by your Secretary and President Paul M. Patterson. George Jeffers, of Longwood College, a Past-President of the Academy was also present at the Council Meeting, representing the National Association of Biology Teachers. The Academy Conference, held under the sponsorship of the AAAS, had a very full program December 28, 1951. The growth of the Academy Conference was noted, some twenty-six Academies being represented at this meeting. The Virginia Academy was represented by the Secretary, President Paul M. Patterson, President-Elect Lloyd C. Bird, and Boyd Harshbarger. Matters pertaining to State Academy finance problems, Junior Academy activities, and State Science Talent Search problems were discussed and participated in by your representatives.

The Constitution for the Academy Conference was approved and accepted at this meeting.

The Membership Committee reports this year has to depend on the present roster of the Virginia Journal of Science, due to the loss of the Master Roster and records. Dr. Henry Leidheiser of the Virginia Institute of Science Research, has been appointed Co-Chairman of the Membership Committee, and the Secretary would appreciate each member of the Academy making a special effort to increase the Senior Membership of the Academy this year, and wherever possible, to upgrade his membership to a higher classification.

FOLEY F. SMITH, *Secretary-Treasurer.*

Richmond, Virginia
April 24, 1952

The Officers and Council Members
Virginia Academy of Science
Richmond, Virginia

Gentlemen:

I have made an examination of the Secretary-Treasurer's books of account and record of

VIRGINIA ACADEMY OF SCIENCE, RICHMOND, VIRGINIA

for the year ended March 31, 1952, and submit herewith my report thereon, consisting of the statements listed in the foregoing index.

The Statements of Cash Receipts and Disbursements, Exhibits "B" and "C" reflect the General Fund and Research Fund cash transactions for the year ended March 31, 1952, respectively. The cash in bank was verified by direct correspondence with the depositary bank and the balances reported were reconciled with the amounts shown on the Consolidated Fund Balance Sheet, Exhibit "A". The cash receipts of record were traced in total to the record of their deposit in bank, and all recorded disbursements were evidence by properly signed cancelled checks with the exception of those checks outstanding at the balance sheet date.

The figures shown on the Consolidated Fund Balance Sheet, Exhibit "A" and Statements of Cash Receipts and Disbursements, Exhibits "D", "E" and "F", relating to Trust Fund accounts were taken from the March 31, 1952, report of the Trust Agent, First and Merchants National Bank of Richmond and were not verified in any manner beyond the confirmation of cash balances.

Income remitted to your treasurer by the Trust Agent was traced as being duly deposited in the bank.

In my opinion the accompanying statements present fairly the position of the Virginia Academy of Science at March 31, 1952, and the

results of its financial operations for the fiscal year, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Respectfully submitted,

J. WADDELL RISON, Certified Public Accountant

VIRGINIA ACADEMY OF SCIENCE
RICHMOND, VIRGINIA
CONSOLIDATED FUND BALANCE SHEET
MARCH 31, 1952

EXHIBIT "A"

ASSETS

GENERAL FUND:			
Cash in Bank (Exhibit "B")		$ 4,660,13	
Accounts Receivable		25.00	
Due From The Virginia Journal of Science		16.00	
Total General Fund			$ 4,701.13
RESEARCH FUND:			
Cash in Bank (Exhibit "C")		$ 1,910.62	
Total Research Fund			1,810.62
TRUST FUND PRINCIPAL ACCOUNT (See Footnote):			
Cash on Deposit (Exhibit "D")		$ 669.73	
Investments (At Cost):			
United States Savings Bonds			
Series F & G (Market Value $7,482.40)		$ 7,837.00	
Series F. & G. (Market Value $7,842.40)	$ 7,837.00		
Stock Securities (Market Value $6,901.26)	4,901.41		
5% Real Estate Note (Secured by First Deed of Trust)	2,200.00	14,938.41	
Total Trust Fund Principal Account....			
(See Footnote):			
Cash on Deposit (Exhibit "E")		$ 122.00	
Total Trust Fund Principal Investment Income Account			122.00

EXHIBIT "A" (Continued)

LIABILITIES AND FUND SURPLUS

GENERAL FUND:			
Advance Payments on Dues	$ 7.00		
Fund Balance	4,694.13		
Total General Fund			$ 4,701.13
RESEARCH FUND:			
Fund Balance	$ 1,810.62		
Total Research Fund			1,810.62
TRUST FUND PRINCIPAL ACCOUNT:			
Fund Balance, March 31, 1952	$ 15,608.14		
Total Trust Fund Principal Account			$ 15,608.14
TRUST FUND PRINCIPAL ACCOUNT - INVESTMENT INCOME ACCOUNT:			
Fund Balance:			
Balance, April 1, 1951	$ 131.88		
Deduct - Excess of Income Distribution and Expense over current year's Income (See Exhibit "E")	9.88		
Balance, March 31, 1952	$ 122.00		
Total Trust Fund Principal Investment Income Account			122.00
TRUST FUND ACCUMULATED INCOME ACCOUNT (see Footnote):			
Cash on Deposit (Exhibit "F")	$ 16.38		
Investment (At Cost):			
Preferred Stocks (Market Value $1,574.75)	1,790.85		
Total Trust Fund Accumulated Income Account			$ 1,807.23
			$ 24,049.12

NOTE:

Trust Fund Account figures were taken from Trust Agent's report, First and Merchants National Bank of Richmond, and exclusive of cash, were not verified in any manner.

EXHIBIT "A" (Continued)

LIABILITIES AND FUND SURPLUS

TRUST FUND ACCUMULATED INCOME ACCOUNT:		
Fund Balance:		
Balance, April 1, 1951	$ 1,790.85	
Add - Dividend Income on Stock	65.52	
	$ 1,856.37	
Deduct - Income distribution (See Exhibit "F")	49.14	
Balance, March 31, 1952	$ 1,807.23	
Total Trust Fund Accumulated Income Account		$ 1,807.23
		$24,049.12

VIRGINIA ACADEMY OF SCIENCE
RICHMOND, VIRGINIA

GENERAL FUND
STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS
FOR THE YEAR ENDED MARCH 31, 1952

EXHIBIT "B"

BALANCE ON DEPOSIT - APRIL 1, 1951			$ 3,412.21
RECEIPTS:			
Revenues:			
Dues:			
Regular Members	$ 1,957.50		
Collegiate Members	60.00		
Contributing Members	348.00		
Sustaining Members	270.00		
Life Membership (Paid on Account)	25.00		
Delinquent Dues for Prior Years collected	253.00	$ 2,913.50	
Transfer of James River Project funds to General Fund		100.00	
Unidentified Receipts		28.00	
Non-Revenue:			
Pledges collected - The Virginia			

Journal of Science	$ 75.50		
Advance payment of dues	7.00		
Special Contributions toward Annual Meeting May 1952:			
To Science Talent Search	725.00		
To Junior Academy Banquet	200.00		
Collections from sales of booth space for May 1952 meeting	90.00		
Collections from sales of booth space for May 1951 meeting - shown below as deduction of meeting expenses, $255.00		1,097.50	
Total Receipts			4,139.00
			$ 7,551.21
DISBURSEMENTS:			
American Association for Advancement of Science Meeting		$ 125.00	
James River Project		19.20	
Junior Academy of Science		125.18	
Annual Meeting Expense:			
Total Expenses Incurred and Paid	$ 271.96		
Proceeds from meeting activities	255.00	16.96	
Miscellaneous and General Expenses - (Schedule "1")		223.46	
Postage and Express Expense		107.17	
Printing Expense		$ 89.85	
Science Talent Search		94.76	
Stationery, Supplies and Stenographic Services		10.00	
The Virginia Journal of Science		1,915.50	
Traveling Expenses		115.00	
Dr. E. C. L. Miller Award		50.00	
Total Disbursements			$ 2,891.08
BALANCE ON DEPOSIT - MARCH 31, 1952 (Exhibit "A")			$ 4,660.13
Consisting of:			
Cash on Deposit First and Merchants National Bank of Richmond - Checking Account:			
General Fund		$ 3,689.47	
James River Project		45.66	
Science Talent Search		725.00	
Junior Academy		200.00	$ 4,660.13

RESEARCH FUND

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS FOR THE YEAR ENDED MARCH 31, 1952

EXHIBIT "C"

BALANCE ON DEPOSIT - APRIL 1, 1951:		$ 1,151.85
RECEIPTS:		
Revenues:		
Income from Trust Investments	$ 660.27	
Gifts, Grants and Bequests	310.00	
Total Receipts		970.27
		$ 2,122.12
DISBURSEMENTS:		
Grants-In-Aid Awards	$ 310.00	
Miscellaneous and General Expenses	1.50	
Total Disbursements		311.50
BALANCE ON DEPOSIT - MARCH 31, 1952 (Exhibit "A")		$ 1,810.62
Consisting of:		
Cash on Deposit First and Merchants National Bank of Richmond - Checking Account		$ 1,810.62

TRUST FUND PRINCIPAL ACCOUNT - PRINCIPAL CASH ACCOUNT

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS FOR THE YEAR ENDED MARCH 31, 1952

EXHIBIT "D"

BALANCE - APRIL 1, 1951		$ 369.73
RECEIPTS:		
Proceeds from Shepperson Deed of Trust Note Installment Due August 28, 1951		300.00
BALANCE - MARCH 31, 1952 (Exhibit "A")		$ 669.73
Consisting of:		
Cash on deposit with Depositary Bank of the Trust Agent, First and Merchants National Bank of Richmond		$ 669.73

TRUST FUND PRINCIPAL ACCOUNT - INVESTMENT CASH ACCOUNT
STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS
FOR THE YEAR ENDED MARCH 31, 1952

EXHIBIT "E"

BALANCE - APRIL 1, 1951:		$ 131.88
RECEIPTS:		
Revenue:		
Dividends on Stock Investments	$ 338.75	
Interest on Federal Government Bonds	$ 195.00	
Interest on Real Estate First Deed of Trust Note	117.50	
Total Receipts		$ 783.13
		$ 783.13
DISBURSEMENTS:		
Remittance to Virginia Academy of Science Research Rund	$ 611.13	
Trust Agent's Commission	50.00	
Total Disbursements		661.13
BALANCE - MARCH 31, 1952 (Exhibit "A")		$ 122.00
Consisting of:		
Cash on deposit with Depositary Bank of the Trust Agent, First and Merchants National Bank of Richmond		$ 122.00

TRUST FUND ACCUMULATED INCOME - CASH ACCOUNT
STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS
FOR THE YEAR ENDED MARCH 31, 1952

EXHIBIT "F"

RECEIPTS:		
Dividends on Investment Stocks		$ 65.52
DISBURSEMENTS:		
Remittance to Virginia Academy of Science - Research Fund		49.14
BALANCE - MARCH 31, 1952 (Exhibit "A")		$ 16.38
Consisting of:		
Cash on deposit with Depositary Bank of the Trust Agent, First and Merchants National Bank of Richmond		$ 16.38

GENERAL FUND
SCHEDULE OF MISCELLANEOUS AND GENERAL EXPENSES
FOR THE YEAR ENDED MARCH 31, 1952
SCHEDULE "1"

Auditing and Tax Services	$ 165.00
Post Office Box Rental	15.00
Virginia Corporation Registration Fee and Franchise Tax	5.00
Fidelity Bond Insurance	12.50
Expenses paid as reimbursement to the office of the Academy's president	18.03
Excess of Secretary's traveling expenses over amount allocated by Council	7.93
Total (Exhibit "B")	$ 223.46

ANALYSIS OF COLLECTIONS FOR AND REMITTANCES TO THE VIRGINIA JOURNAL OF SCIENCE FOR THE YEAR ENDED MARCH 31, 1952
SCHEDULE "2"

BALANCE DUE - APRIL 1, 1951	$ 22.00	$ 236.00	$ 258.00
COLLECTIONS:			
Pledges Received		75.50	75.50
Membership Dues at $2.00 each:			
745 Paid during current year	1.490.00		1.490.00
15 Delinquent dues collected	30.00		30.00
3 Prepaid dues of previous year transferred to current year	6.00		6:00
20 Gratuitous subscriptions to Patrons, Honorary and Life Members	40.00		40.00
(1)	$ 1,788.00	$ 111.50	$ 1,899.50
REMITTANCES:			
April 9, 1951	$ 212.00	$ 60.00	$ 272.00
June 2, 1951	190.00	43.50	233.50
February 9, 1952	902.00	8.00	910.00
February 16, 1952	400.00		400.00
February 16, 1952	34.00		34.00
March 16, 1952	70.00		70.00
March 18, 1952 - Refund from V. J. S.	4.00		4.00
Total Remittance (Exhibit "B") (2)	$ 1,804.00	$ 111.50	$ 1,915.50
BALANCE - MARCH 31, 1952 (1) minus (2) (Overpayment)	$ 16.00		$ 16.00

REPORT OF THE LONG RANGE PLANNING COMMITTEE

At the 1951 Annual Meeting of the Academy, the Long Range Planning Committee was instructed to appoint a sub-committee to study science teaching in the secondary schools of Virginia. After consultation with President Patterson and various members of the committee the Chairman appointed the following as a Committee on the Study of Science Teaching in the Secondary Schools of Virginia: Chairman, Dr. F. G. Lankford, Jr., Department of Education, University of Virginia; Mr. Paul E. Cale, Superintendent of Schools, Albemarle County; Mr. John B. Chase, Department of Education, University of Virginia; Dr. James W. Cole, Department of Chemistry, University of Virginia; Dr. Byron N. Cooper, Department of Geology, V. P. I.; Dr. William M. Hinton, Department of Psychology, Washington and Lee University; Dr. George W. Jeffers, Department of Biology, Longwood College; Mr. F. D. Kizer, Norview High School, Norfolk; Mr. Robert O. Nelson, Superintendent of Schools, Newport News; Dr. Percy H. Warren, Department of Biology, Madison College.

This committee has held two meetings and has taken important steps toward acquiring significant information pertaining to the status of science teaching in the high schools. Dr. Percy H. Warren is presenting some of this information at the current meetings of the Section of Science Teachers. A progress report, prepared by Dr. F. G. Lankford, is herewith presented.

On May 15, 1951, Dr. I. D. Wilson wrote the Chairman of the Long Range Planning Committee suggesting the establishment of a Dismal Swamp Project and the appointment of a committee to initiate the studies. This suggestion has been discussed in considerable detail with members of the committee, officers of the Academy, and the Academy Council. The organization of such a project and committee was authorized by the Council at its meeting on February 10, 1952. Dr. J. T. Baldwin of the Department of Biology, College of William and Mary has been appointed Chairman of the Committee. He appeared before the Council and presented some of his ideas concerning development of the project.

In a communication of February 28, 1952, Dr. Baldwin wrote that the Richmond Area University Center was interested in cooperating with the Academy in the Dismal Swamp Project. The cooperating institutions of the Center pledged $25,000 for the study if the General Education Board would match that amount. An item for the Dismal Swamp Project was included in an application to the General Education Board, as part of the general program of the Richmond Area University Center. Recently it has been learned that the Board has temporarily turned down this item. It is felt that the Swamp Project should be submitted as a unit in itself and not as a part of the general program of the Center.

We are confident that both of these committees are under competent leadership and that the results of their labors will be worthy of the Academy.

A meeting of the Long Range Planning Committee was held on May 15 at Hotel Chamberlin.

MARCELLUS H. STOW

REPORT OF THE RESEARCH COMMITTEE

Fourteen papers were submitted for the J. Shelton Horsley Research Award. Their general excellence made the task of the judges no simple one. The 1952 Horsley Award was won by Dr. D. R. H. Gourley, Department of Pharmacology, University of Virginia Medical School, for material presented to the Academy in his paper "The Mechanism of the Uptake of Radioactive Phosphate by Human, Rabbit, and Chicken Erythrocytes."

"Honorable Mention" was received by Dr. R. A. Bradley and Dr. M. E. Terry, of the Department of Statistics, Virginia Polytechnic Institute, for their two related papers "Rank Analysis of Incomplete Block Designs I. The Method of Paired Comparisons" and "New Designs and Techniques for Organoleptic Testing."

The Research Committee, during the past year, has acted favorably upon the following applications for research grants-in-aid:

1. Dr. J. T. Baldwin, Jr., College of William and Mary: $200.00 for field expenses in study of the plants and vegetation of the Dismal Swamp.

2. Dr. J. J. Murray, Lexington, Virginia: $100.00 for field expenses in making a survey of the birds of the Dismal Swamp.

In case of both of these applications—for studies in connection with the Dismal Swamp project—the Committee approved the award of funds, up to the requested amounts, for travel and field expenses through June 30, 1953, and payable upon the submission of expense accounts to the Secretary of the Academy.

WALTER S. FLORY, JR.

REPORT OF THE FINANCE AND ENDOWMENT COMMITTEE

This Committee met in Richmond on April 30, 1952, and the annual Auditor's Report was reviewed and discussed item by item. As the Auditor's Report will be given in the report of the Secretary-Treasurer, no detailed account will be given at this time.

It was recommended to the Research Committee and the Council that the accumulated income from the Research Fund which now amounts

to approximately $1,800.00 should be made part of the original Endowment Research Fund.

After going over the Auditor's Report carefully and finding our finances in satisfactory condition, the Committee proposed the following budget for the year 1952-1953.

	Spent in 1951-52	Proposed for 1952-53
A.A.A.S. Meeting	$125.00	$ 125.00
E.C.L. Miller Award	50.00	50.00
Junior Academy of Science and Science Talent Search	219.91	225.00
Meeting Expenses	16.96	25.00
Audit and Tax Services	165.00	170.00
Premium on Treasury Bond	12.50	12.50
Stationery Supplies and Stenographic Services	107.17	125.00
Postage and Express Charges	58.46	75.00
Travel Expenses for Representatives to Meetings	115.00	250.00
Subscriptions to Journal of Science for Life Members	----	40.00
	$969.85	$1197.50

The Committee feels that this budget can be followed for the next year. You will note that there is no money set aside for an honorarium in 1952-1953 as under the circumstances the Secretary-Treasurer cannot accept an honorarium, but we feel that his expenses to and from the State and National meetings in the service of the Virginia Academy of Science should be paid. It is this committee's opinion that the $300 for the honorarium for the secretary-treasurer should be kept on record as it may be necessary to use it in later years. For that reason the proposed traveling expenses for the coming year have been increased. It will be noted that budget is approximately $10.00 less than proposed for 1951-1952, but is $277.75 more than was spent in 1951-1952. We have a very slim margin, and every effort should be made to increase the membership in the Academy, and to encourage the present membership to increase their status from the regular to the sustaining or contributing membership.

It is suggested that thorough study should be made for securing funds and establishing an endowment, the interest of which could be used entirely for the general operating expenses of the Academy. This would in no way call upon the Research Fund, but would be an additional source of revenue for the Academy.

GUY W. HORSLEY

REPORT OF THE SPEAKERS BUREAU

In view of the very small number of requests experienced by the Speakers Bureau during previous years, your committee did not prepare a new list of speakers for the entire State.

A list of speakers was prepared for the area around Roanoke and Blacksburg, and a trial run made on the surrounding territory. At the suggestion of A. L. Wingo of the State Department of Education, the divisional superintendents were first contacted asking permission to contact the science teachers through their respective principals. Contacts were made with *six* divisional superintendents and the principals of the schools represented. All contacts were made by personal letter. Response was practically zero.

Your committee recommends that once more this service be offered to the various groups of the state and unless the demand for speakers is fairly large that the committee be discontinued.

S. S. OBENSHAIN

REPORT OF THE COMMITTEE OF THE JUNIOR ACADEMY OF SCIENCE

The Junior Academy of Science Committee at its first meeting, in keeping with its policy of promoting and maintaining interest in science among high school students, decided to concentrate on the following objectives:

1. To work toward establishing better means of communications between the committee and the science clubs. In striving to accomplish this objective, several procedures were followed:
   a. The mailing facilities of the Extension Division under the leadership of Howard R. Richardson were used a number of times.
   b. A science page, instituted by the editors of the V. E. A. Journal was used to advantage. Frank Kizer was instrumental in our being able to use this medium of communication.
   c. Direct correspondence with active clubs was used whenever possible to pass on information.
2. To strive for more widespread use of the Speakers Bureau. The Speakers Bureau was publicized through form letters mailed through the Extension Division. I am sorry to say that very few schools took advantage of the very generous offer of the men on the list. In my opinion this is one phase of our activities that needs to be promoted more vigorously.
3. To work toward increasing the size and number of student and teacher scholarships available in the State. The two summer

scholarships available to science teachers were increased to $100 each. John Hocutt, Chairman of the Science Talent Search Committee, has been instrumental in compiling a rather complete list of scholarships available to outstanding science students in the State.

4. To arouse more interest and participation in regional open houses. The committee decided to ask five schools to sponsor the open houses this year. Emphasis was to be placed on exhibits, demonstrations, lectures, tours, etc. These schools did a magnificent job this year as indicated by the data in the following table:

School	Date	Chairman	Number Reg.	Number Exhibits	Schools Represented
University of Va.	April 26, 1952	E. C. McClintock	511	35	64
V. P. I.	April 25, 26 1952	B. N. Cooper	150	24	5
William and Mary	April 18, 1952	O. Schuette Jr.	-	32	-
University of Rich.	April 15, 1952	W. S. Grable	210	1	12
Hampton Institute	April 25, 26 1952	F. D. Inge	284	22	36
			1155	114	117

5. To make the annual meeting of the Junior Academy of Science a more significant part of the year's program. The President, Raymond Kirby, was given complete charge of planning the junior program. He has done a fine job. The committee was primarily concerned with arranging the exhibit contest. Thirty winners and honorable mentions from open house competition were invited to compete for State prizes. Several other awards were also made at the banquet. The complete list of awards is as follows:

1. Winning Club Exhibit: Hampton High School, Hampton.
2. Second Club Exhibit: Newport News High School, Newport News.
3. Third Club Exhibit: Wilson Memorial High School, Fishersville.
4. Winning Individual Exhibit: Charles Moncure, Radford High School.

5. Second Individual Exhibit: Gerald D. Walberg, Norview High School.
6. Third Individual Exhibit: Ruth V. Womble, Wilson Mem. High School.
7. Miller Award: Martinsville High School, Felix Sanders, Sponsor.
8. Teacher Award: H. Felix Sanders, William and Mary Scholarship.
   Miss Gloria Reid, Oceana High School, Mountain Lake Biological Scholarship.
   Alternate Teacher Awards: Miss Leslie V. Watkins, Andrew Lewis High School, Alternate for William and Mary Scholarship; Miss Susie V. Floyd, Alternate Mountain Lake.
9. Honorary Student Memberships
   A.A.A.S. Raymond Kirby, Norview High School.
   Miss Ruth F. Harrell, Maury High School.
   Miss Doris Hermes, Martinsville High School.
   V.A.S. Charles Moncure, Radford High School.
   Miss Carol Jean Davis, Wilson Mem. High School.
   Miss Ruth V. Womble, Wilson Mem. High School.
   John Garber Moore, Blacksburg High School.

We are very grateful to the Virginia Peninsula Association of Commerce for donating the money for the exhibit awards.

In conclusion the chairman would like to make several suggestions for the future.

1. Adequate functioning of the committee is impossible without a larger budget. Most of the money allotted is spent in stationery, bulletins, cards, etc., with very little left for correspondence. I hope the Academy will seriously consider increasing the budget of this committee.
2. Science Fairs are becoming increasingly popular. In my opinion, this activity should be encouraged and promoted by the committee. Eventually it should become an integral part of the Junior Academy program.
3. Future plans call for the establishment of a four page bulletin to be sent to all organized science clubs in Virginia four times a year. If funds are available for this project, communication between committee and club will become much more effective.
4. Finally I would like to thank the many people who have worked faithfully with me, who have given valuable advice, and to the officers of the Junior Academy who carried on their program so well this year.

GROVER W. EVERETT

REPORT OF THE SEVENTH VIRGINIA SCIENCE TALENT SEARCH

In the Seventh Virginia Science Talent Search, 468 seniors requested Aptitude Examinations from Science Service. Of this number, 99 completed all requirements for competition and of these, one was selected as a Winner and 4 won Honorable Mention in the National Search as follows:

WINNERS:

Ruth Flinn Harrell, Maury High School, Norfolk Virginia.

HONORABLE MENTIONS:

Carol Jean Davis, Wilson Memorial High School, Fishersville, Virginia.

Ruth Virginia Womble, Wilson Memorial High School, Fishersville, Virginia.

Carleton Haddock Jones, Jr., Hampton High School, Hampton, Virginia.

John Garber Moore, Blacksburg High School, Blacksburg, Virginia.

In the Virginia Search, 16 Winners and 29 Honorable Mentions were selected as follows:

WINNERS:

Carol Jean Davis, Wilson Memorial, Fishersville
Lewis P. Dillon, Thomas Jefferson, Richmond
Herman William Gabriel, Thomas Jefferson Richmond
John Goodwin Graham, Wilson Memorial, Fishersville
Ruth Flinn Harrell, Maury High, Norfolk
Lacey Milton Jacobs, Jr., Thomas Jefferson
Carelton H. Jones, Jr., Hampton High, Hampton
David Jeremy Kaplan, Falls Church High, Falls Church
Charlie W. Moncure, Radford High, Radford
John Garber Moore, Blacksburg High, Blacksburg
Clarence Young Peery, Coeburn High, Coeburn
Richard Leslie Raybold, Mt. Vernon High, Alexandria
William B. Robey, Andrew Lewis High, Salem
James Southern Shreve, Falls Church High, Falls Church
Thomas T. Thompson, Hampton High, Hampton
Ruth Virginia Womble, Wilson Memorial, Fishersville

HONORABLE MENTIONS:

Samuel Lee Armfield, Huntington High, Newport News
Edward Gardner Burcher, Newport News High, Newport News
William C. Deans, Thomas Jefferson, Richmond

Charles Monroe Drum, Thomas Jefferson, Richmond
John William Duncan, Thomas Jefferson, Richmond
Michael O. Efird, Norview High, Norfolk
Angela Margaret Groth, Thomas Jefferson, Richmond
John Henry Highfill, Thomas Jefferson, Richmond
Stanley A. Laster, Thomas Jefferson, Richmond
James Lawrence McKenna, Holy Cross Academy, Lynchburg
Nathan Metzger, Thomas Jefferson, Richmond
Dorcas Molumphy, Washington-Lee, Arlington
Arnold B. Moore, Thomas Jefferson, Richmond
John B. Myers, Thomas Jefferson, Richmond
Samuel A. Naff, Newport News High, Newport News
Lawrence A. Nielson, Falls Church High, Falls Church
Betty Joan Parrish, Andrew Lewis High, Salem
Virginia Lee Peters, Andrew Lewis High, Salem
William W. Pettus, Thomas Jefferson, Richmond
John A. Rawls, Battlefield Park, Ellerson
Agnes M. Rennie, Thomas Jefferson, Richmond
Howard W. Silsby, Washington-Lee, Arlington
Sandra Allison Turner, Andrew Lewis High, Salem
Gerald David Welberg, Norview High, Norfolk
Bowden Wilson Ward, Jr., Thomas Jefferson, Richmond
Jean E. Ward, Highland Springs High, Richmond
David Leon Webb, Henry Clay High, Ashland
James B. Williams, Jr., Thomas Jefferson, Richmond
Ann Carol Yeaman, Thomas Jefferson, Richmond

Twenty-eight Virginia colleges have made available more than 100 scholarships ranging in value from $100.00 to $1,000.00 to the 16 Winners and 29 Honorable Mentions named above. A chart listing these scholarships was published and distributed to high school principals, science clubs, and science club sponsors in Virginia, and to all participants in the Virginia Search.

The Committee solicited funds from Virginia industries to help defray the expenses of the 45 Finalists invited to the Academy meeting to participate in the final judging to select the 16 Winners. A total of $1,300.00 was raised for this purpose from the following 15 companies:

American Tobacco Company, Richmond
American Viscose Corporation, Roanoke
Celanese Corporation of American
Coca Cola Bottling Works, Inc., Norfolk
E. I. duPont deNemours and Co., Richmond
Experiment Incorporated, Richmond
Hastings Instrument Company, Inc., Hampton

West Virginia Pulp and Paper Company, Covington
Monsanto Chemical Company, Norfolk
Newport News Shipbuilding and Drydock Company, Newport News
Phipps and Bird, Inc., Richmond
Southern Materials Company, Inc., Norfolk
The Chesapeake Corporation of Virginia, West Point
The Lane Company, Inc., Altavista
The Solvay Process Division, Allied Chemical and Dye Corp., Hopewell, Va.

The Chairman gratefully acknowledges the contribution made to the work of this Committee by the College of William and Mary to the extent of an estimated $250.00 in the form of secretarial assistance, postage and other supplies, mimeographing, travel expenses (for the Chairman), etc.

The Chairman expresses generous appreciation to the officers of the Academy and to the members of this Committee for their wise advice and for their willing and able participation in the Committee's work.

JOHN E. HOCUTT

REPORT OF THE COMMITTEE ON THE EXCHANGE OF FOREIGN STUDENTS

The number of foreign students engaged in academic work in the United States has again increased, though slightly, over the last academic year. The census of students from other countries for the year 1951-1952, as reported by the Committee on Friendly Relations among Foreign Students of New York City, gives their number as 30,462, of whom 23,293 are men and 7,169 are women.

The total number of foreign students in the academic institutions of Virginia at present is 224, of whom 137 are men and 87 are women. For the three preceding years the figures were: 1948-48—177; 1949-50—197; 1950-51—220. It is good to know that Virginia's quota of these able representatives from abroad is gradually increasing, even if not as much as it should.

Again 13 Virginia Colleges and Universities are on the Honor List for having five or more foreign students on their campuses. They are, in comparison with the statistics for last year as follows:

Institution	1951-1952	1950-1951
Virginia Polytechnic Institute	43	36
University of Virginia	41	34
Eastern Mennonite College	16	23
Hampton Institute	15	11

University of Richmond	14	11
Sullins College	10	2
Shenandoah College	9	5
Virginia Intermont College	7	7
Washington and Lee University	7	7
Virginia Military Institute	6	8
Lynchburg College	5	4
Stratford College	5	4
Sweet Briar College	5	5

These students come from 56 different countries, as against 52 countries in 1950-51, and 47 in 1949-50. There are 17 different countries that have sent 5 or more of their students to Virginia this academic year in comparison with 12 last year. These countries and the number of their students follow:

Canada	24	Korea	6
Cuba	21	Liberia	6
Germany	19	Ecuador	5
China	14	Mexico	5
Chile	8	Nigeria	5
Great Britain	8	Panama	5
Japan	7	Peru	5
British West Indies	6	Sierre Leone	5
India	6		

On these statistics certain brief observations may be made. It is significant, but not unexpected, that there is not a single student in Virginia institutions from Soviet Russia or any of her satellite countries, with the single exception of Poland, from which dominated state there is one student in Virginia. It is significant that the number of Chinese in Virginia is steadily decreasing, and under present conditions that is natural, however tragic it may be. Last year there were 30 Chinese students in Virginia, and this year only 14. It is very unfortunate that more students from Greece, Turkey and the Arab countries are not securing the opportunities available in the Virginia institutions of higher learning. Those countries occupy the most significant and strategic position with respect to the critical ideological struggle between East and West in which we are engaged. Virginia should do its part better in helping to train the young men and women from this crucial area. There is only 1 student from Greece, 2 from Turkey, and 4 from all the countries of the Arab World in the institutions of this State. On such a modest basis we cannot do our proper part in liberalizing the thinking of that part of the world or in developing democracies with satisfactory restraints and justice.

EDGAR J. FISHER

REPORT OF THE RESOURCE-USE EDUCATION COMMITTEE

The majority of the conservation-education activities listed in the reports of the past four years have been continued. Although the problems previously pointed out continue to persist, encouraging progress has been made by members of this Committee during the past year in working toward the solution of some of them. Space limitations restrict this report to brief mention of new activities, or those not previously reported.

1. Immediately prior to National Resource-Use Education Week the committee, acting through President Paul M. Patterson, brought to Governor John S. Battle's attention the recommendations from the 1950 report. Governor Battle advised that these matters would be taken up with the State Department of Education.

2. Members of the Committee reported their views on the proposal that a new series of contests be developed to stimulate the interest of high school students in conservation. It was the majority opinion that the present plethora of contests, and the faults inherent in such contests, made initiation of a new series of dubious value; all members encouraged support of the several conservation contests offered by various agencies to the school children at this time.

3. A committee was organized by the National Association of Biology Teachers to promote conservation education in high schools. Prof. C. E. Packard of Randolph-Macon College, Regional Chairman of District Five (including the States of Md., Va., Del., W. Va., N. C., S. C., Ga., and Fla.) has been in contact with this Committee during the past year, and reports that as a result of the cooperation considerable progress has been made.

4. Five members of this Committee participated in the organization of the Virginia Resource-Use Education Council, to work toward "bringing about a better understanding and working relationship among existing agencies dealing with natural resources and to develop and implement a broader educational program in these fields."

5. This Committee suggested to President Patterson its willingness to assist in the development of an annual regional Resource-Use Education Symposium as a feature of Academy meetings if this activity finds the support and sponsorship of two or more interested Academy Sections. The Chairmen of the Biology and Secondary Science Teacher Sections suggested investigation of the possibility of planning this activity for the next annual meeting.

6. An extensive resource-use educational program has been developed in Shenandoah National Park to introduce the public to the recreational use of natural preserves. During the past year this has included the use of guided field trips, nature trails, literature, and 91 lectures. In

addition, a specialized conservation-education organization, the Shenandoah Natural History Association, has been started and is making significant progress.

7. Great progress in forestry education has been reported by the Virginia vocational agriculture division, with 24,573 students enrolled in classes, and 19,421 studying farm forestry. Of these, 5,545 own their own woodlands, and have developed long-term management plans based on sound timber farming practices.

8. Committee members have again served as instructors in the Nature Study Camp of the Garden Clubs of Virginia. Strong interest in the reactivation of summer conservation workshops has been expressed to this committee by Miss Elizabeth Perry, Virginia representative of the Conservation Committee of the Garden Clubs of America.

9. An extension course on Virginia's marine resources and fisheries has been developed by the Virginia Fisheries Laboratory for the in-service training of high school teachers in the Tidewater region. Other resource-use education aids prepared for school use by this organization include loan exhibits on "Fishing Problems" and "Enemies of Oysters;" several excellent new exhibits have been added to the public exhibit room of the Laboratory at Gloucester Point.

RECOMMENDATIONS

Some of the recommendations suggested by certain members of the Committee are as follows:

1. It is recommended that the State of Virginia establish a Resource-Use Education Commission, or Advisory Council. This Commission or Council should be composed of official representatives of State and federal land-use agencies and the State Board of Education. It should serve to advise the Governor and the General Assembly, and the agencies represented, concerning matters pertaining to conservation education, and ways and means of coordinating the total conservation effort.

2. It is recommended that Virginia's institutions of higher learning be encouraged to include courses in the conservation of natural resources. It is also recommended that all teachers graduating from such institutions be required to have had at least one full course in Resource-Use Education before a teaching certificate is granted.

3. The Committee wishes to urge the State Board of Education to add to its staff a trained, full-time Conservation Education specialist to help coordinate activities in this field in the public school system.

4. It is recommended that the State Board of Education institute Resource-Use Education Workshops each summer for the benefit of instructional personnel of the public schools.

5. It is recommended that the State Board of Education supply school administrators, teachers, and libraries in the State with copies of the book "Conservation Education in American Schools," published and

approved by the American Association of School Administrators, National Education Association.

The retiring chairman wishes to express his appreciation for the cooperation received from the officers of the Academy and the members of the Committee. All progress made by this Committee has resulted from this generous assistance.

JOHN THORNTON WOOD

REPORT OF THE COMMITTEE ON VIRGINIA FLORA

Members of the committee have been active in several phases of the work relative to the development of our knowledge of the plant life of the State. Dr. Patterson continues his studies of the mosses of the State, having published phases of the results of his studies. Miss Artz continues her investigations of the flora of the Massanutten area. Mr. Mason has pushed his efforts in photographing native plants and has given a large number of illustrated lectures in various parts of the State thus increasing the interest in our native flora. Mr. Mikula of William and Mary College has accumulated a large collection of plants from various parts of the State.

A major objective of the committee is the future publication of a Flora of Virginia. Preliminary to this is the preparation of a complete check list of the species and varieties of plants known to occur in the State and where they occur. The chairman of the committee has started an annotated list and is reporting on the first section of it at this meeting of the Academy. Other sections will follow as rapidly as feasible. Other phases of the work leading to a complete flora are contemplated for the immediate future.

The development of a State Herbarium at the Virginia Polytechnic Institute has been enhanced by the assignment of a special room for the herbarium with an adjoining work room. Thus the herbarium can be properly arranged and freely used. This will be a big boost to our flora work.

A. B. MASSEY

REPORT OF THE COMMITTEE ON VIRGINIA FAUNA

Accumulation of knowledge on the fauna of Virginia is painfully slow. Those species which have an economic importance, such as insects, fish, and mammals, are receiving considerable attention. The rest of the animal kingdom is being studied by a mere handful of people — often in spare time only.

We do not attach great importance to these neglected faunal groups; yet one of the most serious criticisms of applied ecological research is the failure to consider the community as a whole. The first step in any ecological study of a region is the determination of the species present, together with their distribution and abundance. To a large extent we have not taken this first step in Virginia.

A few examples from the waters of Chesapeake Bay, beside which we are meeting today, will illustrate this point. Last winter, in response to an inquiry, Dr. Austin Clark, who is a world-wide authority on Echinoderms, prepared a key and check list of the Echinoderms of Chesapeake. Surprisingly, the two most common species were not included, for there were neither records of them in the literature, nor specimens in the National Museum. The brackish water mollusks of Chesapeake Bay are very poorly represented in the museums and no adequate check list has ever been publishd; yet half a dozen species are of considerable economic importance. A recent request by the Navy for information on fouling species of Chesapeake Bay has revealed that scarcely any literature exists on the subject and that very little is known about local conditions despite the presence of some of the biggest port installations in the world.

This is the status of faunal information in Chesapeake Bay, one of the most famous and most productive estuaries in the world. No doubt similar conditions exist in certain groups of the land and fresh water fauna of Virginia.

Some states have natural history surveys which enable full time workers to study non-economic groups. Lacking this, we can make a start in Virginia by lending a hand to the small group of specialists which is already studying our fauna. Most of these ecologists are anxious to receive collections from various parts of the State. To aid in getting collections to the right specialists, the directory of persons actively working on the Virginia fauna has been revised and is available from Committee members.

J. D. ANDREWS

REPORT OF THE VIRGINIA JOURNAL OF SCIENCE

This year's publication of the Virginia Journal of Science has been most successful. The Technical Editor, Dr. Horton H. Hobbs of the University of Virginia, and the Assistant Technical Editor, Dr. Mary E. Humphreys of Mary Baldwin College, merit especial recognition. With the service of these two, the section editors, and the Statistics Department of the Virginia Polytechnic Institute it has been possible to continue publication of the Journal for the small sum of $2.00

per member. Whether we will be able to continue publication at this nominal cost depends upon the charges we receive for printing and our ability to get advertisements. Assistance in securing advertisements will be appreciated from any member of the Academy.

Your attention is especially requested in examining the report of the auditor. I would again like to request that all changes of address be in the hands of the Editor-in-Chief at least six weeks before the next mailing of the Journal. Returned Journals increase expenses. No attempt will be made to send out again a copy of the Journal which has been returned to us because of unsatisfactory address.

For the first time the Journal with its small income will attempt to subsidize student membership by allowing students who have paid their dues of $2.00 to receive the Journal. The Journal will be sent to only those students who have paid their dues of $2.00 before July 1 and whose names are submitted to the Editor-in-Chief on or before July 10 by the Secretary-Treasurer and accompanied by $1.25 per student. These students will thereby be eligible to receive the Journal at this rate for one year beginning with the July issue. Any student paying after July 1 will be expected to pay the regular senior membership rate in order to receive the Journal.

The purpose of the Journal is to carry papers based on original research. We therefore solicit all members of the Academy who are doing research to submit articles for publication.

The Academy is indebted to Mr. Joe W. Guthridge for so generously donating his time to audit the books of the Journal and to preparing a report of this audit.

BOYD HARSHBARGER

AUDIT OF THE JOURNAL

Dr. Boyd Harshbarger, Editor
The Virginia Journal of Science
Blacksburg, Virginia

Dear Dr. Harshbarger:

I am enclosing a copy of the audit which I made on the Virginia Journal of Science, and also a statement of accounts receivable.

This audit consisted of a checking of all receipts, expenditures, reconciliation of bank statements, verification of the balance with the Farmers and Merchants Bank of Blacksburg, check of advertising against those printed in the Journal, and verification of extra page charges.

I found that all of the accounts of the Journal were correctly and accurately handled, and to the best of my knowledge and belief,

the enclosed statements represent a true picture of the operation of the Journal.

I would like to call to your attention, as I believe I did last year, the serious delay which you have in receiving the names of the members to whom the Journal is to be sent. As I understand it, these names should be sent to you before the January Journal is issued, but in checking the records I find that you received no accounting from the Secretary of the Academy until February 3rd and then there was a discrepancy between the number of names on the list (651) and the check for $910.00 which accompanied the list.

I feel that this is a poor sort of business operation, and that definite steps should be made to insure an accurate list of Academy members and a check covering the total amount due the Journal in plenty of time so that the January issue can be mailed without delay.

JOE W. GUTHRIDGE, *Auditor*

VIRGINIA POLYTECHNIC INSTITUTE
STUDENT ACTIVITIES OFFICE
OPERATION STATEMENT FOR THE FISCAL YEAR
VIRGINIA JOURNAL OF SCIENCE

Period: May 7, 1951 to May 5, 1952

RECEIPTS:	*Total for the Year*
Contributions	$ 53.50
Academy Subsidy	1734.00
Advertising	414.25
Alderman Library Subscriptions	300.00
Other Subscriptions	40.05
Sale of Extra Pages	514.94
Reprints	15.20
Sale of Extra Copies of Journal	34.08
Total of all Receipts	$3106.02

EXPENDITURES:	*Total for the Year*
Reprints	$ 106.80
Journal Printing and Engraving	2540.15
Postage and Mailing Expenses	179.25
Printing of Index for 1950 and 1951	66.50
Miscellaneous	3.00
Transfer to Savings Account	1500.00
Total of all Expenditures	$4395.70

STATEMENT OF CASH ACCOUNT	
Balance of cash at beginning of year	$2608.32
Add: Total receipts for year	3106.02
Total cash on hand during year	5714.34
Deduct: Total expenditures for year	4395.70
Balance of cash at end of year	$1318.64

Audited by Joe W. Guthridge, May 8, 1952

REPORT OF THE COMMITTEE ON LOCAL ARRANGEMENTS

The Committee on Local Arrangements for the thirtieth annual meeting of the Virginia Academy of Science was drawn from the host institutions — the College of William and Mary in Virginia and the College of William and Mary-Virginia Polytechnic Institute in Norfolk. The dates for the meeting, originally scheduled for May 8, 9 and 10, 1952 at the Hotel Chamberlin, were later changed at the request of the Hotel to May 15, 16 and 17.

The Chairman and several members of the Committee made periodical visits to the Hotel to arrange for the various phases of the Academy meeting. Plans for the meeting of the Junior Academy were worked out in conjunction with John E. Hocutt, Chairman of the Seventh Virginia Science Talent Search, and Grover W. Everett, Chairman of the Junior Academy of Science Committee

Meeting rooms were assigned to the twelve Academy Sections, using registration figures from previous years as a guide in making the most equitable use of available space. Every effort was made to meet the requests for equipment received from the various Sections. In this connection, it is strongly urged by the Committee that it would be a less burdensome and more satisfactory arrangement if each Section, through its Secretary, was made responsible for providing the necessary projection equipment for its own use.

Exhibits from the Junior Academy and commercial and educational exhibits sponsored by the Senior Academy were set up on the Sun Porch and in the Main Lobby. Commercial exhibitors included American Tobacco Co.; Bausch and Lomb; Blakiston Company; Cardinal Products Co.; Carolina Biological Supply; D. VanNostrand Co.; Experiment, Inc.; Fisher Scientific Co.; and Phipps and Bird. The Virginia Fisheries Laboratory staged an educational exhibit.

The College of William and Mary held a Reception at the Mariners' Museum on Friday afternoon, May 16, from 4:00 P. M. to 6:00 P. M., during which time some two hundred and fifty guests were in attendance. It was a special pleasure to have with us in the receiving line Mr. Homer L. Ferguson, Chairman of the Board of Trustees of the Museum, and Mrs. Ferguson.

The Academy held no Banquet at this meeting. Plans for this event had been included in the General Program which was sent to the Journal but they were cancelled at the request of President Patterson acting on the authority of a motion passed by the Council at the Academy meeting in 1950. The President rightly felt that this function was drawing so small a proportion of the membership as to be no longer a truly representative activity of the whole Academy. A later arrangement was made with the Hotel for dining facilities

which would be exclusively reserved for those in attendance at the Academy meeting, and although this necessitated a revision of the meeting-room assignments as printed in the General Program, the Committee is convinced that the arrangement was a most desirable one.

The income from the meeting was more than sufficient to meet all meeting expenses and the balance will accrue to the Academy.

The Committee records its sincere appreciation of the wholehearted cooperation received from the management of the Hotel Chamberlin in making all necessary arrangements for the meeting. The Chairman gratefully acknowledges the valuable assistance of Edward S. Harlow and Foley F. Smith in the early stages of the work of the Committee, and sincerely thanks all the Committee members for their continuous help.

W. G. Guy

REPORT OF THE VIRGINIA INSTITUTE FOR SCIENTIFIC RESEARCH

The outstanding accomplishments of the Research Institute for the past year have been the purchase of several major pieces of scientific equipment and an appreciable increase in the amount of sponsored research.

The Institute since its beginning has been seriously handicapped by the lack of costly research equipment, and in most of the studies carried out in the past the metal single crystal has served as an instrument for investigating the mechanism of surface reactions. As reported last year the Jeffress Memorial Foundation had offered the Institute $18,000 for the purchase of equipment provided an equal amount could be raised elsewhere. During the past year Mr. Buford Scott of Richmond generously promised to help raise the necessary amount. One industrial concern in the Richmond area made a sizable grant for the purchase of equipment which would be of specific use in their research studies, and another company in the Tidewater area contributed a costly lathe. Although $3,000 still remains to be raised to match completely the offer of $18,000, yet sufficient funds, including savings from the operation of sponsored projects, have been available to purchase recently an X-ray diffraction unit, a Spinco ultra-centrifuge, and a large model RCA electron microscope. The diffraction unit is especially useful in determining the inner crystal structure of materials, the electron microscope in studying the surface structure of solids and the size and shape of very small particles, and the ultracentrifuge is especially useful in determining the molecular weights of large sized molecules such as those found in plant and animal products. These

instruments may be very useful in the future to research laboratories in this region.

Some seven or eight projects have been carried out during the past year. The first sponsored project undertaken by the Institute, a study of the mechanism of bright nickel electroplating, is still being continued. A major undertaking of the Institute since its beginning has been the growth and preparation of large single crystals of metals in various shapes and orientations for use at the Institute and in other laboratories. This work has steadily grown in size, and plans are now under way for increasing the crystal growing facilities. Another sizeable and interesting project which was begun last fall for a large oil company consists of the study of the reaction used in the manufacture of hydrocarbons, especially synthetic gasoline, from carbon monoxide and hydrogen. A study has recently been begun for a local concern of the separation with the aid of the centrifuge of the different molecular weight constituents in a natural farm product. Other smaller projects have been concerned with attempts to electroplate titanium, the new wonder metal, and with a continuous process for the manufacture of metal powders used in powder metallurgy. At the present time the Institute is negotiating for several additional projects.

During the winter a new furnace was installed in the building at the Institute's expense, and increased facilities, such as plumbing, electrical wiring, and laboratory benches have been added to the laboratory.

At the present time the Institute has about ten employees, a few of whom such as the stenographer work part time. The Institute is specially indebted to Mr. Robert Kean for his services as secretary and treasurer, and to Mr. Robert Jeffress, Mr. Buford Scott, and Mr. Edwin Cox for their assistance in raising funds for the purchase of equipment. All members of the Virginia Academy are invited to visit the Research Institute to see for themselves the studies which are now being carried out.

ALAN T. GWATHMEY

REPORT OF THE COMMITTEE ON ACTIVITIES FOR COLLEGIATE MEMBERS

The Committee's main activity for the year has been centered about the task of trying to stir up a little enthusiasm for the 1952 meeting of the Virginia Academy of Science. Members of the Committee, located at some eighteen colleges in the state, were contacted and asked to talk to the students in their schools about attending the meeting of the Academy. Due to the apparent lack of enthusiasm and a change in the arrangements at the hotel, the luncheon, usually held for the college members, has this year been cancelled.

The one bright spot in the year's activities has been the expressed intention of the Hampden-Sydney Chapter of Chi Beta Phi to affiliate with the Academy as a college chapter. This will bring to three the number of such groups, the other two being at V. M. I. and V. P. I.

It might be wise for the Executive Committee to evaluate the Committee on Activities for College Members and give to the Committee some indication of what its purpose should be and to what ends it might apply itself.

ROBERT P. CARROLL AND JOE W. GUTHRIDGE

REPORT OF THE JAMES RIVER PROJECT COMMITTEE

Efforts of the Committee during the past year have been devoted to sale of the Monograph. In March 1952 individual letters were sent to ninety-eight members of the Academy distributed widely throughout Virginia and adjacent areas. These letters asked if the recipient would undertake to sell ten copies of the James River Monograph to his friends and associates. Enclosed with each letter were ten stamped and addressed order cards. Nine sets of cards were returned by the addressees, for various reasons. As of May first, four volumes have been sold by this method. Mr. Justus H. Cline has sold thirty-two copies in the community of Stuarts Draft.

Herewith is a statement of sales and expenditures for the period May 1, 1951 to April 30, 1952, and a statement of total distribution of the book.

Summary as of April 30, 1952

Total copies distributed as of April 30, 1951	381	
Balance on deposit, Peoples National Bank, Lexington, Va. as of April 30, 1951		$1124.06
Complimentary copies distributed between May 1, 1951 and April 30, 1952	14	
Sold, payment received at $6.00 between May 1, 1951 and April 30, 1952	84	504.00
Sold, payment due, between May 1, 1951 and April 30, 1952	5	30.00
Total distributed between May 1, 1951 and April 30, 1952	103	
Total cash received between May 1, 1951 and April 30, 1952		504.00
Deposits in bank between May 1, 1951 and April 30, 1952		534.00
Expenditures charged to Monograph account between May 1, 1951 and April 30, 1952		126.16

Net balance in Peoples National Bank from sales May 1, 1951 to April 30, 1952	407.84
Total balance in Peoples National Bank from sales May 11, 1950 to April 30, 1952	$1531.90
Total copies distributed May 11, 1951 to April 30, 1952	484

MARCELLUS H. STOW

REPORT OF THE COMMITTEE ON SCIENCE TEACHING IN VIRGINIA SCHOOLS

The Committee on Science Teaching in Virginia Schools has held two meetings. One of these was held on January 16. At this meeting plans were made for several studies.

Professor Percy Warren of Madison College reported that he already had underway a study related to the interests of the Committee. The Committee gave him some suggestions for enlarging his study. His study will deal with teaching assignments of science teachers in the high schools of the State as well as preparation of science teachers.

Mr. John B. Chase, Jr., an instructor in the Department of Education, University of Virginia, agreed to undertake a study of certification of science teachers. He agreed to find out the requirements in other states and to ascetain the views of school superintendents in Virginia as to desirable certification requirements.

Mr. Lankford reported that he has a student pursuing a thesis for a Master's degree which deals with science offerings in Virginia high schools and pupil elections of science courses. He promised to communicate with this student, Mr. Philip Peterson, and urge him to complete the study and to make his findings available to the Committee.

Mr. James W. Cole was asked to explore possibilities of interesting Virginia industry in contributing financially to the work of the Committee.

The second meeting of the Committee on Science Teaching in Virginia Schools was held on April 29. At this meeting Mr. Warren reported considerable progress on his study and his acceptance of an invitation to present a preliminary report of it at the Old Point meeting of the Academy of Science. Mr. Cole reported that he had talked with some representatives of Virginia industry and found them interested in the Committee's work. The Committee felt, however, that any request of Virginia industry for financial assistance should come through the Academy in order to avoid duplication of appeals. In particular, it was thought that if the Committee decided later to publish some of its finds, financial assistance would be needed at that time.

Mr. Chase reported that he had completed his study to certification requirements in other states and had begun distribution of a questionnaire to superintendents.

Mr. Peterson reported that he expects to complete his study during the summer.

The committee expects to meet again in October, at which time it is anticipated that the three studies under way, by Mr. Warren, Mr. Chase and Mr. Peterson, will be completed.

It was recommended by the Committee that we ask the Finance Committee of the Virginia Academy of Science for an appropriation of fifty dollars to be used to pay the costs of the research studies which could not reasonably be borne by the individuals making the studies.

F. G. LANKFORD, JR.

Minutes of the Thirtieth Annual Meeting of The Academy May 16, 1952

A meeting of the Academy was held in the Roof Garden of Hotel Chamberlin Friday, May 16, 1952, at 8:00 p. m. President Paul M. Patterson, presided, and introduced President A. D. Chandler, of the College of William and Mary, to welcome the members of the Academy on behalf of the Host Institutions, William and Mary College, and the College of William and Mary and the Virginia Polytechnic Institute in Norfolk, directed by Lewis W. Webb, Jr.

President Patterson presented the thanks and appreciation of the Academy to W. G. Guy, as Chairman of the Committee on Local Arrangements, for its excellent and painstaking work in making this meeting a success. He then introduced Dr. Walter Flory, who presented the J. Shelton Horsley award.

Dr. D. R. H. Gourley, Department of Pharmacology, of the University of Virginia Medical School, won the award on two papers presented before the Medical Sciences Section of the Academy. The paper was entitled "The Mechanism of the Uptake of Radioactive Phosphate by Human, Rabbit, and Chicken Erythrocytes." Dr. Gourley gave a short resume of his paper. Doctors R. A. Bradley and M. E. Terry of the Statistics Department, Virginia Polytechnic Institute, received Honorable Mention. Dr. Patterson then presented Mrs. Turbin Jones, the Sponsor of Miss Harrell of Norfolk, a National prize winner in the Science Talent Search. Miss Harrell was presented to the Conference, and gave a synopsis of her essay.

Dr. E. C. L. Miller, Secretary-Treasurer Emeritus of the Academy, was presented to the audience, and was followed by Dr. Raymond Taylor, Assistant Executive Secretary for the American Association for the Advancement of Science, who made a few remarks about the affiliation of the Virginia Academy with the AAAS. Dr. Guy W. Horsley, Chairman of the Nominating Committee, presented the report of that committee.

It was moved, seconded, and passed that the report be accepted, and the following officers were declared elected:

President—Lloyd C. Bird.

President-Elect—Allan T. Gwathmey.

Sidney S. Negus—Councillor to 1957.

Walter S. Flory—Councillor to 1954, the unexpired term of John N. Buck.

Dr. E. C. L. Miller—Secretary-Treasurer Emeritus.

Foley F. Smith—Secretary-Treasurer.

It was moved, seconded, and passed that the secretary be instructed to cast a unanimous vote, and the new officers were installed by Dr. Patterson.

Ladley Husted gave the Resolutions Committee report. This report was adopted and will follow.

Bruce Reynolds made the report for the Place of Meeting Committee, and recommended that the invitation of the Virginia Military Institute, Lexington, be accepted as the meeting place for the Academy in 1953. It was moved, seconded, and passed that the invitation be accepted.

There being no further business, the speaker of the evening was introduced by Dr. Patterson; Professor E. Newton Harvey, Princeton University, who gave an interesting talk on the phenomena of "Bioluminescence."

FOLEY F. SMITH, *Secretary*

REPORT OF THE RESOLUTIONS COMMITTEE

Be It Resolved, that the Virginia Academy of Science pays tribute to the memory of esteemed members lost by death during the year past: E. T. Betten, T. Wood Campbell, Earl K. Fischer, H. Hiter Harris, Charles L. Reed, P. L. Reed.

Be It Further Resolved, that the Virginia Academy of Science records its grateful appreciation to the sponsors of this the thirtieth annual meeting—The College of William and Mary, and the Norfolk Division of the College of William and Mary and the Virginia Polytechnic Institute.

Be It Further Resolved, that the Virginia Academy of Science commends the Local Committee on Arrangements, under the leadership of Mr. William G. Guy, for making possible a most successful meeting.

Be It Further Resolved, that the Virginia Academy of Science expresses its appreciation of the part John Hocutt, Grover Everett, and the host institutions have played in furthering the interests of the Science Talent Search and the Junior Academy.

LADLEY HUSTED

TABULATION OF REGISTRATION

Section	*Academy Members*	*Non-Members*	*Total*
1. Agricultural Sciences	14	6	20
2. Astronomy, Mathematics and Physics	23	33	56
3. Bacteriology	10	16	26
4. Biology	72	25	97
5. Chemistry	60	43	103
6. Education	5	2	7
7. Engineering	10	11	21
8. Geology	20	7	27
9. Medical Sciences	21	7	28
10. Psychology	18	9	27
11. Science Teachers	14	9	23
12. Statistics	18	11	29
No designated Section	12	55	67
	287	234	521
Junior Academy Registration			180
TOTAL REGISTRATION			701

Meeting of the Council Saturday, May 17, 1952

Members of the Council were breakfast guests of Lloyd C. Bird, Hotel Chamberlin, at 9:00 a. m., Saturday, May 17, 1952. President Lloyd C. Bird presided at the business meeting following breakfast. Present were: Walter Flory, I. G. Foster, President-Elect Allan T. Gwathmey, Boyd Harshbarger, Guy W. Horsley, Ladley Husted, E. C. L. Miller, Secretary-Treasurer Emeritus, Sidney S. Negus, Paul M. Patterson, Marcellus Stow, and Foley F. Smith.

The scholarships which were given by the various State Institutions for the winners of the Science Talent Search were discussed from a standpoint of having them continuing past the first year, provided the holder completed his work satisfactorily. It was decided that the administrations for the various colleges which offer the scholarships would be continued to see if the scholarships could not be made continuing under those conditions, and if they could be offered as continuing scholarships, rather than for one year only.

After discussion, it was decided to streamline the Academy Conference meeting, by eliminating those committee reports which are informative only, since they will be published in the Proceedings. Only those reports that require action or discussion by the Conference would be given at this meeting, which would materially shorten this session of the Annual Meeting—one which is becoming quite lengthy, due to the increased number and length of Committee reports.

The Secretary was instructed to write a letter of thanks to Mr. and Mrs. Homer Ferguson for their participation in the reception given the Academy at the Mariners Museum on Friday, May 16.

It was decided to hold the next meeting of the Council sometime during October 1952.

There was further discussion concerning changing the present fiscal year of the Academy to correspond with the calendar year. It was decided further consideration would be given the problem and no official action was taken at this time.

It was moved, seconded, and passed that the J. Shelton Horsley Award be increased to $100.00 from the present sum of $50.00.

Dr. Guy Horsley discussed the possibility of raising funds to establish another Endownment fund for the Academy, the income of which would be used exclusively for the general expenses and operation of the Academy. It was moved and passed that Dr. Horsley further investigate the possibility of raising the money to establish such a fund.

President Patterson expressed his thanks to the Council for their aid during his administration.

There being no further business the meeting adjourned at 10:10 a. m.

FOLEY F. SMITH, *Secretary*

Minutes of the Council Meeting Charlottesville, February 10, 1952

A meeting of the Council was called by President Patterson, and held in Room 3, of Miller School of Biology, University of Virginia, Charlottesville, at 1 p. m., February 10, 1952.

President Patterson called the meeting to order with the following members present: President-Elect Lloyd C. Bird, Horton H. Hobbs, Jr., Ladley Husted, Guy W. Horsley, Boyd Harshbarger, I. G. Foster, Marcellus Stow, J. T. Baldwin, Jr., L. W. Jarman and Foley F. Smith.

President Patterson noted that it would be necessary for the Nominating Committee to nominate an additional Councillor for Allan Gwathmey and another interim appointment for Victor Tiedjens.

It was noted that travelling expenses for Foley F. Smith were authorized by the President to attend the Diamond Jubilee American Chemical Society, in New York, in September, 1951.

Marcellus Stow was commended for his excellent compilation of the chronological data concerning the James River Basin project. Dr. Stow presented a bound volume for the archives of the Academy.

Dr. Stow also gave a report on the Long Range Planning Committee, and presented the list of members of the Committee appointed for the "Study of High School Science Teaching." He reported that this committee was functioning under the Chairmanship of F. G. Langford.

Dr. Stow next gave a report on the proposed Dismal Swamp Study.

J. T. Baldwin, Jr., of the William and Mary Biology Faculty, agreed to accept the Chairmanship of this project, provided the study would be made on a strictly scientific basis, and that a complete study in all phases be made which could be developed into a scientific treatise. It was moved, seconded, and passed that such a project as outlined by Dr. Stow and Dr. Baldwin, concerning the study of the unique area of the Dismal Swamp be undertaken by the Academy, and recommended that the committee proceed with details of the investigation of what could be done.

Mr. Jarman led a discussion concerning the necessity for a detailed study to be made covering the history of past, present, and future State Science Talent Search winners.

The question of increasing the budgets for the Science Talent Search, Junior Academy of Science Committee, and the Speakers Bureau was discussed at length. President Patterson also requested that the Annual AAAS Council and the Academy Conference meetings be reported by the Virginia Academy of Science representative at the May meeting.

Dr. Boyd Harshbarger made a report to the Virginia Journal of Science in which he proposed a new status for Student Membership. This report follows:

REPORT OF THE EDITOR-IN-CHIEF OF THE VIRGINIA JOURNAL OF SCIENCE TO THE COUNCIL

Gentlemen:

For the benefit of the group I would like to again summarize the methods used in mailing the Journal.

1. In January the Secretary will give to the Editor-in-Chief the names of members who have paid their dues for the current year. This list is accompanied by a check amounting to $2.00 for each of the paid members. No January mailing will be made until the list has been submitted and check received. All addressograph plates are pulled except those on this list.

2. No additional mailings are made until issue No. 2 of the Journal is released. At that time Journals are sent to all on the original list and also to new members and old members who have paid up their dues. The additions to the original list must be accompanied by a check of $2.00 for each name added. Back copies of the Journal are sent to new members and to those who were in arrears at the previous maiilng.

3. Future issues are handled in the same manner.

4. The secretary will submit his list and check only at the time of mailing at the 15th of the month in which the Journal is to come out. If any changes from this date are necessary, the secretary will be advised by the Editor.

I would like to suggest that the Academy adopt the following:

1. That the student membership dues be raised to $2.00 a year, payable by July 1.

2. That the Secretary present to the Editor the names of all students who have paid, together with $1.25 for each such name.

3. Beginning with the July issue all Journals would be mailed to all paid-up students.

4. That no student in arrears receive the Journal. A complete new list of paid-up student members would be supplied to the Editor by the Secretary on July 1 of each year with a check of $1.25 for each such member. Any student not on the July 1 list wishing to join the Academy should specify for which year he wishes to receive the Journal. No Journal will be sent out to any student member unless he has paid in advance and the $1.25 for his subscription has been given to the Editor.

It was moved, seconded, and passed that the By-Laws be changed for student membership to conform to the policy enumerated above.

There being no further business, the meeting adjourned at 4:20 p. m.

FOLEY F. SMITH, *Secretary*

Minutes of the Junior Academy of Science Business Meeting

The meeting was called to order by President Raymond Kirby, of Norview High School, Norfolk.

The minutes of the previous meeting, read by the secretary, Tommy Thompson of Hampton High School, were approved.

The reports of the Business Meetings of the Junior Academy Committee, held at Lynchburg College, October 27, 1951, and at Hotel Richmond, February 9, were read.

A roll call of Affiliated Clubs revealed that thirteen were in attendance.

A motion was made from the floor that all exhibits, both club and individual, must be entered at Open Houses and be on their list of "eligibles" in order to qualify for being judged at the Annual Meeting of the Virginia Junior Academy of Science. The motion was duly seconded and carried.

(There were nine eligible Club Exhibits, and 28 Individual exhibits on display for the judging at Hotel Chamberlin).

The following officers were elected to serve during 1952-1953:

President—Claude Barfield, Newport News High School, Newport News, Virginia.

President-Elect—Erven Tyler, Hampton High School, Hampton, Virginia.

Secretary—Charles Chamberlayne, Norview High School, Norfolk, Virginia.

An announcement was made that Mr. Grover Everett had resigned as Chairman of the Junior Academy of Science Committee because he would be out of the State during the coming year. Mrs. Thelma C. Heatwole, Wilson Memorial High School, Fishersville, will serve as Chairman for the year.

Adjournment.

Virginia Junior Academy of Science Dinner Meeting

About 250 Junior and Senior Academy members were present. Presiding—Raymond Kirby, President, Norview High School, Norfolk. Recognition of Guests and Officers. Recognition of incoming officers.

Welcome Address—Dr. Paul M. Patterson, President of Virginia Academy of Science.

Granting Awards for Junior Academy Exhibits—Mr. Grover Everett, Chairman, Virginia Junior Academy of Science Committee. The list of award winners is contained in the Report of the Committee of the Junior Academy of Science.

Granting Awards to Virginia Science Talent Search Winners and Honorable Mentions—Dr. J. E. Hocutt, Chairman Virginia Science Talent Search.

Speaker of the evening—Dr. William A. Kepner, University of Virginia.

Minutes Of The Section of Agricultural Science [1]

E. M. DUNTON, JR., *Chairman*

R. C. CARTER, *Vice-Chairman*

T. J. NUGENT, *Secretary*

WESLEY P. JUDKINS, *Section Editor* (1956)

FRIDAY, MAY 16, 1952 — 9:00 A. M. — CHAMBERLIN HOTEL

1. The Relationship of Research to the Vocational Agriculture Department.

H. W. Sanders; *Virginia Polytechnic Institute, Blacksburg.*

Teachers of vocational agriculture in the public high schools are dependent upon the research worker for technical information. This information should be in a form that is easily understood, it should be up-to-date, and it should be adapted to the area in which it is to be used.

The teacher of agriculture constitutes one of the important links between the research worker and the farmer. In 1951-52, there were 664 teachers of vocational agriculture in Virginia, teaching a total of 86,882 people, including 7,419 veterans in the institutional on-farm training program.

Among the ways whereby teachers and research workers may continue to work together with increasing effectiveness are (1) fuller participation of teachers in field studies of research workers, (2) a reduction in the lag between the time results of research become known and the time they are put in practical use, (3) channeling research findings directly to the teachers as well as to other groups, thus making all research results available to those who can use them in the least possible time, and (4) continuing to improve the form of presentation, emphasizing the practical rather than the technical.

2. The Relationship of Research and Extension.

L. B. Dietrick; *Virginia Agricultural Extension Division, Blacksburg.*

Research, Extension, and Resident Instruction are all members of the same family. The parent is the Land-grant College made possible by the Morrill Act of 1862. Land-grant colleges were originally established largely for classroom instruction. They set a new departure in education—the education of the many instead of the few.

Limitation of subject-matter brought about the Hatch Act in 1887 establishing the experiment stations to find out the WHY and HOW and to extend the borders of knowledge. This was followed in 1914 by the Smith-Lever Act establishing the Extension Service to carry such findings to the field and to assist people in putting the results of research into practice.

The following relationships should be stressed:

1. Research workers must find the facts and serve as the source of information. The function of the Extension Service is to help agricultural people put the results of research into practice.

2. The research worker must understand the problems of industry and the home. The extension worker can bring him firsthand information on this.

3. It is the responsibility of both Research and Extension to work together and carry on a dynamic program to meet the needs of the people.

3. The Research-Extension Team.

H. N. Young; *Virginia Agricultural Experiment Station, Blacksburg.*

Those who do the research and those who carry its results to the public must maintain a strong research-extension team which will work together to the mutual advantage of each and in the interest of the public welfare. Those who do the research must (1) maintain well balanced programs which are directed toward present and future problems; (2) keep their programs ahead of the problems which seem likely to need a solution; (3) plan their work so that reliable conclusions may result, and (4) publish the results promptly. The extension worker must (1) keep up to date on research results; (2) report accurately these results; (3) demonstrate and adapt research results to local conditions and situations; (4) help plan the research program; and (5) assist in planning and conducting experimental demonstrations. Various methods for closer teamwork between research and extension were discussed. —*Abstracted by T. J. Nugent.*

4. The Inter-Relationship of Agricultural Research, Education, Development, and Regulation.

Parke C. Brinkley; *Virginia Department of Agriculture, Richmond.*

The four agencies—research, education, development, and law enforcement—were discussed as a team, each member of the team having his own harness but all pulling toward the same goal. Through research, better tools are found with which to work. Through education, the information obtained from research is transmitted to the farmers. Through development, the producer and consumer are aided by better food processing, transportation, distribution, and retailing. Law enforcement polices agriculture to prevent unfair practices that would be against the interest of the producer or consumer. In order to illustrate how the four agencies work together the author cited the Harrisonburg egg project. —*Abstracted by T. J. Nugent.*

5. The Place of the Soil Conservation Service in Virginia, Agriculture.

S. W. Bondurant; *Soil Conservation Service, Richmond.*

(no abstract available)

6. A Study of the Effects on Milk Production of Zeolite Process Softened Water when Consumed by Lactating Sows.

G. C. Graf and C. W. Holdaway; *Virginia Polytechnic Institute, Blacksburg.*

Twelve lactating cows were divided into two groups which received "hard" water and "soft" water for two 57 day periods. The cows were milked twice a day and received the same amount of alfalfa hay, corn silage, and grain.

The "hard" water consumed by the cows in this experiment contained 290 ppm. of total hardness and the "soft" water contained less than 1 ppm. of total hardness.

The total feed intake of the two groups of cows was equal.

The cows, while on "hard" water, produced 33.0 pounds of milk, consumed 97.1 pounds of water daily and gained eight pounds of body weight per cow for the entire period.

The cows, while on "soft" water produced 33.2 pounds of milk, consumed 97.1 pounds of water daily and gained one pound of body weight for the entire period.

There were no significant differences in the milk production and the body weight changes between the cows on "hard" water and the cows on the "soft" water.

7. The Effect of Feeding Irradiated Yeast on the Blood Calcium Level of Dairy Cows.

Paul M. Reaves, J. R. Reed, and D. C. Newbill; *Virginia Polytechnic Institute, Blacksburg.*

Previous work on feeding small dosages of irradiated yeast to dry cows for a period of 6 to 8 weeks failed to reduce the incidence of milk fever. Recently, Ohio research workers reported that massive doses of vitamin D fed as irradiated yeast for 4 or 5 days previous to calving was effective in preventing milk fever.

The plan of this trial was to use cows from the V. P. I. Jersey herd which has had a high incidence of milk fever. These cows were due to calve in the fall of 1951. They were to be fed one-half pound daily of irradiated yeast containing 64 million units of Vitamin D per pound, for 4 or 5 days previous to calving and for 2 days after calving.

Blood samples were drawn on the day that the yeast feeding began and on the following days.

There was an increase in the level of blood calcium after 3 to 5 days of feeding massive doses of Vitamin D. The results give an indication that the incidence of milk fever may be lowered.

8. The Influence of Blossom Removal and the Method of Transplanting on the Rate of Runner Formation in Strawberries.

M. M. Parker; *Virginia Truck Experiment Station, Norfolk.*

The removal of blossoms and small green fruit from newly transplanted strawberries produced a 63 percent increase in the number of runner plants when a prolific plant making variety was used: a 115 percent increase in a variety that was classified as an intermediate plant maker, and a 635 percent increase in a variety that was a shy plant

maker. The data were taken one month after the completion of harvest on the check plots.

Plants set with the roots straight up and down in the soil produced 58 percent more runner plants three months after transplanting than those that had the roots bent at right angles at the time of transplanting. Plants set with the roots straight but with one-third of the root system cut off at transplanting produced 20 percent more runner plants than those set with the roots bent over.

9. Report on the Systemic Control of Thrips and Leafhoppers Injurious to Peanuts.

W. L. Howe and L. I. Miller; *Tidewater Field Station, Holland.*

"Systox," a phosphate systemic insecticide known chemically as O,O-diethyl-0-2(ethylmercapto)-ethyl thiophosphate, applied to soil as a drench before planting was effective against tobacco thrips, *Frankliniella fusca* (Hinds) and potato leafhopper, *Empoasco fabae* (Harr.).

Dilutions of 2, 4, 8, 16 and 32 mls. of 32 percent "systox" per liter of water were applied to plots 1/660 Acre in size.

Populations of immature thrips were effectively reduced by 16 and 32 ml. dilutions but not at lower dosages.

Leafhopper control was ineffective at the 2 ml. dilution, was progressively better at higher dosages, and nearly perfect at the 16 and 32 ml. dilutions.

A reduction in pod injury by the southern corn rootworm, *Diabrotica undecimpunctata howardi*, Barber, was noted at the higher "systox" dosages. A low infestation rate, prevented a critical evaluation of its effectiveness.

Small necrotic leaf lesions, of non-parasitic origin, occurred in all the seedlings receiving "systox." Injury was slight at the lower dilutions but was progressively more severe as dosage increased. The leaf lesions did not occur after the middle of July. More brown pod stain occurred in plots receiving the 16 and 32 ml. dilution treatments than in non-treated plots.

10. Preliminary Report on Systemic Insecticides for Pest Control

D. E. Greenwood and R. N. Hofmaster; *Virginia Truck Experiment Station.*

(no abstract available)

11. A Comparison of Two Methods of Calculating Yields for Experimental Corn Plots.

R. K. Stivers, W. Skrdla, T. H. Taylor, M. T. Carter, and R. D. Sears; *Virginia Polytechnic Institute, Blacksburg.*

The 1950 and 1951 acre yields of experimental corn plots at four locations in Virginia were determined by two different methods of calculation. In one method the moisture percentage in the grain and the weight of ears were used. Weight of ears to make a bushel of shelled corn containing 15.5% moisture was taken from tables adapted from A. A. Bryan's work and from work done in Ohio. The second method

involved an air dry sample of ears that had been weighed at harvest and then calculating yields for each plot from its own shelling data. The latter method resulted rather consistently in lower average calculated yields in both years at all locations and was considered the standard or more nearly accurate procedure. Although there is a real difference in the yield data obtained by these two methods, their correlation coefficients were significantly and positively correlated in both 1950 and 1951. The regression equations for these two methods were noticeably different in these two years.

Higher moisture percentages in the cob probably caused lower yields calculated from shelling data than those calculated from moisture percentage and weight per bushel data obtained in the Corn Belt.

12. Hybrid Corn Field Plots to Check Label Statements Attached to Hybrid Seed Corn Offered for Sale in Virginia.

J. W. Midyette, Jr.; *Virginia Department of Agriculture, Richmond.*

A satisfactory method has been developed to determine the accuracy of label statements relative to the hybrid designation of seed corn. Samples collected on the open market by state seed inspectors are planted adjacent to an authentic check of the same hybrid. The checks for closed-formula or privately developed hybrids are obtained from the producer. For open-formula or public-produced hybrids the checks come from the Virginia Agricultural Experiment Station and the Virginia Crop Improvement Association. Three replications are planted and comparisons are made throughout the growing season. The following characteristics are considered: 1. general appearance, 2. type and color of foliage, 3. type and color of tassels, 4. color of silks, 5. plant and ear height, 6. resistance to disease, 7. standability and lodging, 8. type of shuck and extent of covering, 9. type and color of ear, 10. type and shape of kernels, 11. color of cob, and 12. yield.

On the basis of these tests and other data, recommendations are made to the Commissioner by an Advisory Committee composed of representatives of the Seedsmen's Association, Seed Stocks Organization, Virginia Agricultural Experiment Station, Virginia Crop Improvement Association, and independent growers. Action may then be taken on lots judged to be misbranded.

BUSINESS MEETING SECTION OF AGRICULTURAL SCIENCES, MAY 16, 1952

At the close of the speaking program the annual business meeting was held. The following men were elected to hold office for the 1952-1953 period.

Chairman—T. J. Nugent, Virginia Truck Experiment Station, Norfolk.

Vice-Chairman—H. Marshall Clark, Tidewater Field Station, Holland.

Secretary—R. C. Berry, Virginia Department of Agriculture, Richmond.

Section Editor—Wesley P. Judkins, Virginia Polytechnic Institute, Blacksburg.

Minutes of the Section of Astronomy, Mathematics, and Physics [2]

B. Z. LINFELD, *Chairman*

S. M. HEFLIN, *Secretary*

I. G. FOSTER, *Section Editor* (1956)

FRIDAY, MAY 16, 1952—10:00 A. M.—BAYVIEW ROOM, CHAMBERLIN HOTEL

1. Mechanical Properties of Thin Films of Silver[1].

J. W. Beams, H. Morton, and W. E. Walker; *University of Virginia.*

In the study of the mechanical properties of thin films it is important to apply the stress uniformly in order to prevent "tearing" or other forms of stress concentration. The method of spinning magnetically suspended rotors in a vacuum is almost ideal for this kind of investigation.[2]

In the experiments described here films of silver of known thickness were electroplated on small steel rotors, and the rotational speed required to throw them off of the rotors was measured. The tensile strength was then computed from the equation:

$$4\Pi^2 N^2 R^2 p = (T + AR)/h$$ where,

N revolutions per second
R Radius of the rotor
p density of the film
T tensile strength
A adhesion of the film
h thickness of the film

It was found that the tensile strength was constant over the thicker values of the film (approximately 22,000 pounds per square inch) but at a film thickness of 2×10^{-5} inches it suddenly increased by a factor of ten or more.

2. Interferometer Method of Measuring Sedimentation in the Ultracentrifuge[3].

A. Robeson, N. Snidow, and J. W. Beams; *University of Virginia.*

Two sector-shaped cells mounted side by side in the ultracentrifuge rotor are sealed by the same pair of quartz windows. Monochromatic light from a timed spark is split into two beams, one of which passes

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2. J. W. Beams, J. L. Young and J. W. Moore, J. App. Phy. 17,886 (1949).

1. The work described in this paper was supported by the U. S. Navy Bureau of Ordnance under Contract NOrd-7873.

through the first cell containing the solution where sedimentation takes place while the other passes through the second cell which contains the solvent only. The two beams then are recombined to form interferometer fringes. The beam splitter consists of a half silvered and a full silvered mirror with their silvered surfaces parallel. The beams are recombined by a similar arrangement except the two surfaces may be slightly tilted with respect to each other. By proper adjustment the ultracentrifuge cell and the fringes are focused sharply on the photographic plate. A second pair of cells containing the solvent only are mounted in the rotor in place of the usual dummy. This provides reference fringes from which the fringe shifts due to sedimentation are measured. Strains in the windows are approximately compensated, and high precision is obtained.

3. An Eight Cell Ultracentrifugal Rotor.

John E. Miller and Joseph F. Swingle; *University of Virginia.*

In order to measure the sedimentation or flotation rates in several samples of material simultaneously, a centrifuge rotor with eight cells equally spaced around the rotor was developed. The radius to the center of each cell is 65 mm., and the rotor spins in a vacuum. A synchronous light source was developed which consisted of a magnesium spark that was triggered at the proper time to send the light through the particular centrifuge cell under investigation. The magnesium spark light was passed through a monochromator, and the sedimentation or flotation rates were measured by means of an interferometer. The number of samples which could be centrifuged at one time is increased by a factor of four without lowering the precision of the measurements.

4. Electrical Potentials Produced in Conducting Single and Polycrystalline Material by Centrifugal Fields[4].

J. W. Beams; *University of Virginia.*

It has long been that if a centrifugal field is applied to an electrolytic solution (galvanic cell) an electric potential is produced between two radial distances in the solution. This potential decreases with time and should vanish when sedimentation equilibrium occurs. Recently, MacInnes[5] has determined the transference numbers with high precision by this method. In the present work, a study is initiated on the radial potential produced by the application of centrifugal fields to single crystal and polycrystalline conducting materials. The apparatus is a modification of the air driven vacuum type ultracentrifuge so arranged that the radial potentials may be measured to a precision of a few microvolts. Since the potential produced by the centrifugal field is from 10^1 to 10^5 times larger for electrolytic conduction than for electronic conduction in the substances under investigation, the method distinguishes between the two types of conduction. Also a measure of the magnitude of the mobilities of the ions which produce the conduction is obtained.

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3. Supported by Navy Bureau of Ordnance Contract NOrd-7873.
4. This work was supported by a Navy Bureau of Ordnance Contract NOrd-7873.
5. MacInnes, Ann. New York Acad. Sci. 43,243 (1942); MacInnes and Ray; J. A. C. S. 71,2487 (1949).

5. Acceleration of Electrons by Coupled Resonant Cavities.

William H. McMaster and Glen S. Waterman; *University of Virginia.*

For the acceleration of electrons to energies of the order of 1 Mev a linear accelerator has been constructed by coupling together two cylindrical, doubly reentrant, resonant cavities. Each cavity is powered by a Western Electric 7C22 twin triode oscillator operating at a mean frequency of 410 Mc/sec and is fed by an 18 kv square pulse of 6 microsecond duration. This accelerator has been operated with a thoriated tungsten filament electron source and a vacuum arc transmission line which gives a burst of electrons of aproximately 7×10^{-9} sec. duration. The tuning of the two oscillator-cavity pairs is accomplished by sampling the fields within the cavities by means of a magnetic loop and feeding this sample to a high speed synchroscope. The trace on the synchroscope gives the envelope of the energy stored in a cavity, and the cavity is turned until the resonant frequency is reached where the energy stored is a maximum as shown on the synchroscope.

6. A Problem in Differential Equations.

D. R. Carpenter; *Roanoke College.*

In the designing of auditoriums for theaters and other public buildings it has been common practice of architects to elevate the floor at the rear to increase the total clearance of the line of vision from the seats in the rear to a focal point on the stage or screen; also to curve the floor in such a manner as to distribute the total available clearance equally among the rows of seats. Architectural schools and offices have used the graphical method to approximate the construction of this curve although it has proved to be tedious. The purpose of this paper is to derive the equation for constructing this curve by analytical methods.

Rectangular coordinates were used for obvious reasons, the origin of the axes being at the focal point on the stage. The equation was set up in differential form by letting the differential of x (dx) represent the spacing of the seat rows and dx/k represent the clearance of each row. The resulting equation is $y=\frac{x}{k} \ln \frac{x}{ck}$. The elevation of the focal point is controlled by the constant c and the slope of the floor by k.

7. Group Motion and Velocity Dispersion of Red Dwarf Stars.

Edward R. Dyer, Jr.; *Leander McCormick Observatory, University of Virginia.*

Previous investigations of the motions of red dwarf stars have led to anomalous results, which are attributed to the effects of selection in that the known red dwarfs had been discovered on account of their conspicuous proper motion, while those with small motions had remained undetected. In 1941 Vyssotsky and his students at this Observatory began a systematic survey of objective-prism plates, on which stars of a given type can be recognized by their spectra. By 1949 more than 300 red dwarfs (spectral type dK8-dM5, magnitude 8-12) had bene found, about half of which were previously known. The author observed the remaining 170 at the Mount Wilson Observatory

in 1948-50. A preliminary least-squares solution based on the radial velocities of this representative sample of 309 stars led to the following results:

Solar motion (reflection of group motion)	:	15±2 km/sec.
Toward Apex at Right Ascension (1950)	:	276±7°
Declination (1950)	:	+20±8°
Velocity Dispersion	:	±27 km/sec.

These values tend to confirm Vyssotsky's independent result[6] that the red dwarfs behave dynamically like the normal main-sequence stars of small mass that they are, and not anomalously.

8. An Apparatus for the Demonstration and Study of Elastic Scattering Phenomena for an Advanced Undergraduate Laboratory.

The Class of '51-'52 of the Advanced Undergraduate Laboratory Course in Physics at the University of Va.

The technique of using simulated potential fields by means of rubber sheets and the experimental study of the motion of particles in such potential field is widely known. The apparatus to be described has been designed and constructed in order to study by simple means some of the mechanical and atomic problems of scattering of particles by potential fields, with emphasis on Rutherford scattering. It consisted of a wooden framework holding an elastic rubber sheet, the surface of which has basically a $\frac{(\text{constant})}{(R)}$ form, thereby simulating a repulsive Coulomb potential.

Small steel balls were given kinetic energy by a tubular slide tilted at a variable angle with the horizontal, and then rolled on the black rubber surface and deflected by the repulsive potential hill. Stroboscopic pictures of the rolling ball were taken. The light was supplied by a type 648 A.G.R. stroboscope. Displacement, velocity, and acceleration as a function of time could be read directly from the photographs. The scattering formula were quantitatively checked, and the successive dependence of the scattering angle on the impact parameter and initial kinetic energy was studied.

The experiment also provides a means to introduce the student to photographic and darkroom techniques.

BUSINESS MEETING

On the report of the nominating committee the following officers of the section were elected for the year 1952-1953:

Chairman—S. M. Heflin, Virginia Military Institute.

Secretary—L. W. Webb, Jr., The College of William and Mary and the Virginia Polytechnic Institute in Norfolk.

Section Editor—I. G. Foster, Virginia Military Institute.

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6. Astrophysical Journal 104, 239 (1946).

9. Description and Performance of Precision Scattering Equipment[7].

K. B. Rhodes,[8] A. J. Allen, J. S. Arthur, R. S. Bender, H. J. Hausman, L. M. Diana, and C. J. McDole; *University of Pittsburgh.*

A description is given of the Precision Scattering Equipment now in use at the University of Pittsburgh. The charged particle spectra of several elements are given as examples of performance of the apparatus. The charged incident particles are obtained from the 47-inch cyclotron, and bymeans of a 6-tone focusing magnet, are directed into a remote underground room through an 8-foot shielding wall. The underground room contains the scattering chamber and two similar 7-ton magnets. The energy analyzing magnet directs a beam of 0.5 - 1.0 microampere of 8-Mev protons with an energy spread of + 10 Kev into the scattering chamber through 1/16-inch analyzing slits. The other magnet may be rotated from 0° to 150° around the scattering chamber for analysis of charged particles produced by nuclear reactions in the target which is mounted in the scattering chamber. Polonium alpha particles were used for calibrating and trimming the magnets.

10. Angular Distribution of Mu-Mesons Scattered in Magnetized Iron.

Stephen Berko; *Rouss Physical Laboratory, University of Virginia.*

Experiments based on the deflection of mesons penetrating a magnetized block of iron have two-fold interest. They provide an answer as to the effective vector acting on charged particles passing through a ferromagnetic medium; second, they form a simple technique to get the positive vs. negative momentum spectrum of mesons. In previous experiments which show that the macroscopic B is the effective vector acting on the mesons, computed corrections had to be made for the effect of multiple scattering. While the Italian group[9] successfully separated particles of opposite sign, there has been no report on the direct measurements of the momentum spectrum.

In the experiment to be described the differential angular distribution due to multiple scattering in a block of iron of a collimated meson beam was observed by a set of 12 counters. The change in the distribution curve when the magnetic field was turned on was then observed. This enabled us to account for multiple scattering in a direct experimental way. The observed effect agrees with the assumption that B is the effective vector. The asymmetry introduced by the field shows the positive excess of mesons.

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7. Work done in the Sarah Mellon Scaife Radiation Laboratory and Assisted by the Joint Program of the Office of Naval Research and the Atomic Energy Commission and the Research Corp.

8. On leave from Virginia Military Institute, Lexington, Virginia.

9. F. Rasetti, Phys. Rev. 66,1 (1944); Bernardini, et al, Phys. Rev. 68, 109 (1945).

11. The Pressure of Waves.

L. G. Hoxton; *University of Virginia.*

It is well known that the pressure exerted by plane waves on a material surface is equal to the energy density in the waves, when the incidence is normal. The proof of this may be made very short if the conception of standing waves is introduced. It is shown that the energy stored in waves trapped between two parallel reflecting planes varies inversely as their separation, so that external forces are required to keep the planes in place, whence follows the result. Corresponding results hold for waves along strings and over surfaces. The method is offered for its possible teaching interest.

12. Study of Magnetic Properties of Iron Using Electron Diffraction Technique.

David F. Cope; *University of Virginia.*

An electron optical Schlieren Effect is utilized to study the magnetic changes of pure iron at high temperatures. In a low voltage electron microscope using two magnetic lenses the specimen is placed between the two lenses, and its image is formed on a fluorescent screen. Beyond the lens system is placed a fine mesh copper screen whose position is adjusted so that its shadow pattern is superimposed upon the image of the specimen. Both images are magnified. In the absence of any disturbance of the electron beam the undistorted screen pattern appears as a network of regular squares. However, any disturbance of the beam distorts these shadow patterns. A specimen of iron at normal temperatures, being magnetic, will deviate the electron beam and thereby induce distortions in the shadow pattern of the screen mesh. When the iron is heated to the Curie Point it changes from a ferromagnetic to a paramagnetic material, and the disturbing influence on the beam is reduced. The method thus provides a very sensitive way of measuring the temperature of the Curie Point correlating the temperature measurements with observed pattern changes. Moreover, other magnetic changes in the specimens may be detected.

13. Two High Current Electron Guns.

D. Rae Carpenter, Jr.[10]; *Virginia Military Institute.*

X-ray spectroscopic research on solid state problems in recent years has indicated a need for high intensity x-ray beams. To secure such beams two high current electron guns were studied for possible use in x-ray tubes. One design was that of Dr. Oskar Heil of Ohio State University and the other was of a type described by Dr. J. R. Pierce of Bell Telephone Laboratories. These guns produced electron beam currents up to 500 ma at beam voltages up to 5 kv. These beams could be focused on a target in focal spots from 5 to 25 mm. in diameter at target power dissipations up to 3500 watts.

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[10] Work done at Cornell University in partial fulfilment of the requirements for the degree of Master of Science.

14. The Scattering of High Energy Circularly Polarized Photons by Polarized Electrons.

Forrest P. Clay and Frank L. Hereford; *University of Virginia.*

The possibility of detecting circularly polarized photons through Compton scattering by polarized electrons has been suggested in several recent theoretical treatments. Fano describes the polarization and intensity of an incident photon by a four vector constructed from the Stokes' parameters and the scattering of this photon into another state by a 4 x 4 matrix relating the Stokes' parameters of the incident and scattered photons. This matrix predicts a dependence of the intensity of the forward direction Compton electrons produced by circularly polarized photons upon the spin orientation of the electrons before the scattering collision. We have investigated this result experimentally by observing in coincidence the forward direction Compton electrons produced in magnetized iron foils (2 of 26 orbital electrons polarized) by positron-electron annihilation photons. An annihilation photon pair is known to reflect the singlet state of a positron-electron pair prior to annihilation. Hence the two photons are respectively left and right or right and left circularly polarized. In the experiment the forward direction Compton electrons were detected and recorded by a fast scintillation counter coincidence circuit. The observed dependence of the coincidence counting rate upon the direction of magnetization of the iron foils was slightly greater than that computed using Fano's theory.

15. High Energy Neutron Counting with Organic Scintillation Crystals.

R. E. Garrett, F. L. Hereford, N. D. Mallory, and B. W. Sloope; *University of Virginia.*

A number of recent investigations[11] have indicated that certain organic crystals and liquids scintillate under fast neutron bombardment. We have observed the differential pulse height spectrum from a number of such phosphors excited by 2.5 Mev monoenergetic neutrons. The neutrons were provided from the bombardment of a D_3PO_4 target with 250 Kev deuterons from an atmospheric Van de Graaff machine. Scintillations deriving from the recoil protons in the phosphors were detected by an RCA 5819 photomultiplier, amplified, and analysed by a sliding channel type differential pulse height discriminator. These data will be presented and discussed. Work is in progress on the effects of multiple scattering of the neutrons in the phosphors and nonlinearity of the pulse height-energy relation for the recoil protons.

16. A Modified Eagle Mounting for a Concave Grating.

J. B. Breazeale; *Virginia Military Institute.*

In the Eagle mounting for a concave grating three adjustments must be made in moving from one part of the spectrum to another.

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11. G. E. Owen, J. Neiler, and L. C. L. Yuan, Phys. Rev. 83,176 (1951). A bibliography appears here.
J. E. Francis, P. R. Bell, and J. C. Gundlach, Rev. Sci. Inst. 22,133 (1951).

The grating must be moved toward or away from the plate holder, and both the grating and plate holder must be rotated about a vertical axis. It has been found that by fastening the grating and plate holder to the ends of two rods having a length equal to the radius of the Rowland Circle, and fastening the ends together to form a hinge, that the instrument will remain in focus when it is shifted from one spectral region to another. A description of a spectrograph which has been built using this modification is given. It was found that the instrument remained in good focus throughout four orders of the visible region.

17. A Photoelectric Pyrometer.

Walter L. Crider and J. F. Ryman; *Virginia Polytechnic Institute.*

This pyrometer was built to supply a need for a quick reading, portable, high temperature measuring instrument which is suitable for use with a recorder and a furnace temperature controller. The sensing element of the pyrometer is a photoelectric tube having a very low thermal capacity, which is used with a stable amplifier. The power may be supplied from any 110 volt a.c. line. Reproducible temperature readings to ± 1% were obtained over the range of the instrument.

18. Uniformity Measurement of Textile Materials by Capacitance Variation.

E. J. Bernet and D. F. Nieman; *Institute of Textile Technology, Charlottesville.*

This paper is a brief description of the ITT Uniformity Analyzer and its application in the textile industry.

The textile material is run between two plates of an electrical capacitor and as such forms part of the dielectric. As the amount of textile material in the measuring capacitor varies, the resultant variations in capacitance are sensed, amplified, and used to drive a high speed recorder for a permanent record of variations in weight per unit length.

The heart of the instrument is a modified phase shift discriminator with certain novel features covered by the patent to Bernet *et al* of ITT. Voltage from a crystal oscillator is capacitively coupled to a high "Q" tank circuit, a portion of whose capacity is the measuring capacitor. When variations in textile material cause the tank to turn through resonance the difference voltage at the diode outputs traces the familiar "S" curve and the center linear portion is used for measurement. Sensitivity is 10 to 15 x 10^{-11} farads for full scale deflection or about 2 x 10^{-15} farads/volt.

Materials at various stages in processing such as picker lap, sliver, roving, and yarn are tested in this device.

19. Recent Experiments in Gas Dynamics Using High Rotational Speed Techniques[12].

A. R. Kuhlthau and W. E. Myers; *Ordnance Research Laboratory, University of Va.*

Previous experiments[13] have demonstrated the feasibility of using a high rotational speed concentric cylinder apparatus for the study of viscous effects in a rarefied gas. The inner cylinder was rotated at very high speed by means of an air turbine arrangement, similar to that used in an air driven vacuum type ultra-centrifuge. The outer cylinder completely surrounded the inner cylinder and was supported coaxially with it so as to constitute a torsion balance. This complete encirclement of the rotor gave use to undesirable boundary conditions due to the rotor ends which added complications to a theoretical analysis of the system. Refinements in the apparatus will be described and results will be presented which establish a technique for eliminating these end effects. A comprehensive comparison between theory and recent experiments with this apparatus will be made. This will include all pressures ranging from what is normally classified as molecular flow upward to the slip region.

20. Newton's Interference Fringes From Coated Surfaces.

H. Y. Loh; *Virginia Polytechnic Institute.*

The Newton's interference fringes produced by various surfaces, namely: ellipsoid, paraboloid, and hyperboloid of revolution and circular cone are discussed. The $\sqrt{n}$ relationship is found to be true for all these cases under certain conditions. Interference patterns from some of such surfaces coated with highly reflecting films are shown. Some applications of the interference fringes are discussed.

21. Television Principles—A Demonstration.

Frederick L. Brown and Melvin E. Cruser; *University of Virginia.*

A stencil is scanned mechanically by a light beam passing through a scanning disc operated by a synchronous motor. The light then falls on a photoelectric cell connected to the Z terminal of a DuMont 304-H oscilloscope, thereby varying the intensity of the electron beam. By means of two sweep circuits, the electron beam is made to traverse the face of the oscilloscope in synchronism with the scanning disc so that the variations of intensity reproduce the object scanned. The system is a modification of the one discussed by Robert E. Benn in The American Journal of Physics for October, 1949.

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12. The experiments described were performed in part at the University of New Hampshire under sponsorship of Office of Naval Research and in part at the University of Virginia under sponsorship of Contract NOrd-7873.

13. Jour. App. Phys. 20,217, (1949).

22. A Long Period Variable Near Mu Pegasi.

Harold L. Alden; *University of Virginia, Charlottesville.*

A long period variable, previously unknown, was discovered on plates taken with the 26 inch McCormick telescope 17′ north and $0^m.9$ west of the star μ Pegasi. It had been selected as a reference for determining the trigonometric parallax of a near-by star. The following season it was invisible. On subsequent plates it sometimes appeared but never as bright as on the initial plate. From 11 photovisual observations between 1943 and 1950 and 32 visual observations during the last two oppositions, the period was found to be 337 days with a maximum on April 21, 1950. When brightest the variable is of the 10-th magnitude, just visible in a 2 inch telescope. At minimum it is invisible in the 26 inch telescope, giving a range of more than a hundredfold in the visual brightness. The mean light curve is characterized by a rapid rise to a narrow maximum and a more leisurely descent to a broad flat minimum.

23. Variation of Electrical Conductivity with Crystal Grain Size.

L. G. Hoxton; *University of Virginia*[14].

Evidence is given, in the case of nickel, that the fine grained structure characteristic of drwn wire has, in general, a greater conductivity than that of single crystals and coarse grained visible crystalline structures. The multiplying factors are often greater than 2 and infrequently less than 1.5.

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14. This work is part of that done under N. A. C. A. Contracts Nos New-5831 and 6052.

Minutes of the Section of Bacteriology [3]

WILLIAM A. DORSEY, *President*

W. FRENCH SKINNER, *Vice-President*

MISS ADAH CORPENING, *Secretary-Treasurer*

J. DOUGLAS REID, *Section Editor* (1956)

FRIDAY, MAY 16 — 10:00 A. M. — ROTUNDA ROOM

1. Growth Studies on *Endamoeba histolytica.*

E. Clifford Nelson; *Medical College of Virginia.*

In the course of extract medium studies relative to the role of various ingredients the author has found that the agar slant plays an important part, partly due to a small magnesium content. Tests have been made of a variety of substances to see if they can serve as a substitute for agar. In the course of testing filter paper, cotton, and paraffin magnesium was supplied in the form of phosphate and successful replacement of the agar obtained.

2. A New Staining Method for the Rapid and Precise Identification of Anaplasma in Bovine Blood.

Major W. L. Wallenstein; *University of Maryland.*

A simple contrast stain for use in diagnosis of the protozoan disease of cattle, anaplasmosis, is described. Both thin and thick smears of blood may be made on a single slide. The author has found this staining procedure less complicated for field use than the standard Giemsa or Wright stains. A motion picture demonstrating the use of this staining procedure completes the presentation.

3. A Serologic Study of Serum from Suspected Cases of Infectious Mononucleosis.

Elsie P. Foxhall; *Laboratory of Virginia Health Department, Richmond.*

All sera showing heterophile agglutinins by the Paul-Bunnell and Davidsohn tests were tested by the Kolmer Complement Fixation Test and the V.D.R.L. Slide Test for syphilitic antibodies. False positive syphilis serology was obtained in only 12% of the specimens with the Kolmer and 6% with the latter test. The author suggests that the small number of false positives may be due to the cardiolipin-lecithin antigen used in the serologic tests.

4. Experiences of the Multiphasic Screening Program from a Laboratory Standpoint in Richmond, Virginia.

William A. Dorsey and W. J. Williams; *City of Richmond Department of Public Health.*

The authors describe the problems concerned with organizing and handling the laboratory part of a "mass screening" program. The laboratory findings are briefly discussed.

5. Water Quality Survey of the Hampton Roads Shellfish Area 1949-1950.

William G. Gay; *Virginia State Department of Health, Norfolk.*

With the use of charts the author discusses the areas surveyed in 1949-1950. It is concluded that, with certain exceptions, the tidal waters of Hampton Roads are generally of better bacterial quality than they were in 1934, despite a large increase in sewered population. This is largely due to the construction of additional sewage treatment plants in this area. Continued careful operation of plants is considered essential for maintaining a low bacterial density in the waters of the Roads. Potential hazards to shellfish areas still exist, one of which is the unregulated discharge of raw sewage from ships in this area.

Minutes of the Section of Biology [4]

J. D. ANDREWS, *Chairman*

H. G. M. JOPSON, *Vice Chairman*

ELMIRA C. MAURICE, *Secretary*

LADLEY HUSTED, *Section Editor* (1952)

FRIDAY, MAY 16 — 9:00 A. M. — ROOF GARDEN

1. Microincineration Studies of *Flabellula mira*, Schaeffer.

Zoe Wells Carroll Black; *Mary Washington College of the Unisity of Virginia.*

Previous reports have established that a shift of iron takes place in this amoeba when it is passed vertically across the line of force of a magnetic field of 3500 gauss. Microincineration reveals the position of iron particles.

This work has been extended into a comparison of the effectiveness of vertical and horizontal motion in the magnetic field. The vertical motion is shown to be more effective. Exposures for different time intervals revealed a sudden change at 384 seconds at which the migration of iron within the cell appears to be produced.

2. The Effects of Various Environmental Factors on the Hatching of Eggs of *Plagitura salamandra*, Holl, 1928 (Trematoda: Plagiorchiidae).

Catherine M. Russell; *University of Virginia.*

Eggs containing cell masses obtained from gravid *Plagitura salamandra* were matured *in vitro*. Matured eggs were exposed to various chemicals, chemical mixtures, amylolytic enzymes, as well as extracts of digestive tracts of snails (host specific and non-specific).

Hatching was accomplished in many of the substances tested. The most rapid hatching, resulting in the liberation of active miracidia, occurred in a solution of KCl having a pH of 7.0.

3. Observations on Speciation in Anoetid Mites.

Roscoe D. Hughes and Caroline O. Goode; *Medical College of Virginia.*

Speciation in the genus *Histiostoma* (Anoetidae) is related to length of life cycle, habitat, distribution, chromosome complex, morphology, and mode of reproduction. Discussion centers around twelve species, only one of which has been previously described. Eleven new species, as yet unnamed, are described — eight in detail. Of particular interest is the mode of reproduction and chromosome complex. No bisexual

species have so far been discovered in the Anoetidae. Three of the twelve species examined are thelytokous with diploid number of 10 ("Oak," "Cheli," "Fuzzy"). The remaining nine species are definitely arrhenotokous (*H. laboratorium* diploid number 8, "W. Va." - 8(?), "Hamp." -16 (?), "Barb" -(6), or probably arrhenotokous ("Boss'- 8, "Chick" - 6, "Steve" -(?), "Dice"- (?), "Tex"- (?)).

4. Cyperaceae in Liberia.

E. Nelmes and J. T. Baldwin, Jr.; *Royal Botanic Gardens, Kew, Richmond, Surrey, and College of William and Mary.*

Eighty-one — possibly eighty-three — species and five varieties of Cyperaceae are now recorded for Liberia. Some of these sedges exhibit precise ecological preferences; others are of general occurrence. Synonymy is given for the various taxa, and for each of them specimens are cited and full collection data stated. Keys for specific and varietal identifications are included. Ten species are illustrated.

5. Chromosomes of *Hymenoxys*.

J. T. Baldwin, Jr. and Bernice M. Speese; *Department of Biology, College of William and Mary.*

Thirty-five collections of *Hymenoxys* representative of both subgenera, of 14 of the 24 recognized species, and of five varieties have been cytologically examined; seeds were supplied by K. F. Parker who is monographing this genus of Compositae

Twelve species have 2*n* numbers of 30; *H. acaulis* has 2n numbers of 60 in three varieties and of 30 in another variety; *H. odorata* has a 2n number of 22. Evidence is that the diploid variety of *H. acaulis* should possibly be specifically separate from the tetraploid varieties. Chromosome morphology promises to be of limited value in drawing lines between taxa in *Hymenoxys*.

H. odorata consists of annuals closely related to chromosomally unknown annual plants including the type species — *H. anthemoides* — and the two South American species. If it should be discovered that this complex of annuals generally do not fit into the basic 15-chromosome series exhibited by the majority of the species in the genus (which is predominantly perennial), further taxonomic revision of *Hymenoxys* would be requisite.

6. Chromosomal Numbers and Morphology of Certain Species of the Moss Genus Anomodon.

Martha Barber; *Hollins College.*

In the study of five of the six species of the genus *Anomodon* of North America, namely *tristis, minor, attenuatus, rostratus, and viticulosus,* it was found that the haploid chromosomal number in each species is four. The cell and nuclear sizes do not correlate directly with the comparative plant sizes. The differences in the sizes of nuclei and cells in the different species suggest the possibility of polyploidy, but none occurred in the species studied.

7. A Preliminary Report on the Crayfishes of the Atlantic Slope from New Brunswick to South Carolina.

Horton H. Hobbs, Jr.; *University of Virginia.*

Within the drainage systems emptying into the Atlantic Ocean between New Brunswick and the Black River in South Carolina are some 16 species of crayfishes belonging to three genera. The genus *Procambarus* is represented by three species, only one of which ranges north of the Chowan drainage in North Carolina. The genus *Orconectes* is represented by five species, none ranging farther south than the Chowan system, and one of these has been introduced. The genus *Cambarus* is represented by nine species, only one being found in most of the drainage systems south of the Hudson River; one exclusively north of the Hudson; and five are restricted to ranges south of the Susquehanna River.

8. A Preliminary Report of the Mollusca of Hanover County, Virginia.

Paul R. Burch and John B. Burch; *Radford College and Randolph-Macon College.*

Thirty-five species and sub-species of snails, four species of slugs, and six species of bivalves are listed for Hanover County, Virginia, with some notes on distribution and ecology.

BUSINESS MEETING

Officers elected for 1952-1953 were:

Chairman — H. G. M. Jopson, Bridgewater College.

Vice-Chairman — Zoe Wells Carroll Black, Mary Washington College of the University of Virginia.

Secretary — Vera Baron Rimsberg, Longwood College.

Section Editor — Robert T. Brumfield, Longwood College (1957).

9. Notes on the Life History of the Croaker, *Micropogon undulatus.*

Dexter S. Haven; *Virginia Fisheries Laboratory.*

The commercial catch of croakers, *Micropogon undulatus*, in Chesapeake Bay has declined in recent years. Since 1949 a program to determine possible reasons has been in progress at the Virginia Fisheries Laboratory.

Available literature on the croaker shows a lack of basic information on its life history. Its spawning areas have never been delimited, and its eggs have never been identified in plankton collections. There is little information on its migratory habits or on its rate of growth. The distribution of young in Chesapeake Bay is also poorly known. A cooperative tagging program with the U. S. Fish and Wildlife Service was completed in 1950. About 1000 croakers were tagged with about 9% returns.

Recent work includes a length frequency study of commercially caught croakers and an age analysis. A morphometric study on croakers from various plces on the Atlantic coast is in progress. The early distribution of the young is being followed with the aid of a small trawl net.

10. The Tidal, Freshwater Rivers of Virginia and their Fisheries.

William H. Massmann; *Virginia Fisheries Laboratory.*

The tidal, freshwater river sections in Virginia are not well known. They have characteristics of estuaries, rivers, and lakes. Most of the commercially important anadromous and freshwater fishes are dependent on these river sections.

Although tidal, freshwaters make up only four per cent of the area fished by Virginians, the value of the fishes dependent on this area is almost thirty-five percent of the value of all edible fin fishes taken commercially by Virginians.

The relatively small but important river sections have been greatly altered by dams, pollution, and changes in the courses of rivers. Investigations of the Virginia Fisheries Laboratory include a program to obtain basic information on the spawning and nursery areas of the most valuable fishes and the effect of pollution in these areas.

11. The Circulation and Mixing in the James River and Possible Resulting Effects on Oyster Larvae Distribution.

D. W. Pritchard; *Chesapeake Bay Institute, The Johns Hopkins University, Annapolis, Maryland.*

The most obvious water movements in the James River are oscillatory tidal currents. However, superimposed on these oscillatory currents is a net circulation pattern which results in a mean current directed down the estuary in the surface layer, and up the estuary in a lower layer below ten feet in depth. In this estuary the salinity distribution is maintained primarily by this mean advection plus vertical mixing. Horizontal mixing is unimportant. If oyster larvae were to be carried by the circulating and mixing water as an inert suspended particle, their resulting distribution would be somewhat different from that observed. It is suggested that oyster larvae tend to remain grouped together as a result of some biological process. The effect of the circulation pattern on the distribution of the grouped oyster larvae is discussed.

12. Parasites and Diseases — A Probable Check on Bobcat Populations.

Donald R. Progulske; *Virginia Cooperative Wildlife Research Unit, Virginia Polytechnic Institute.*

A research study of the bobcat (*Lynx rufus rufus*) currently being carried on at the Virginia Cooperative Wildlife Research Unit indicates that parasites and diseases are a probable check on bobcat populations. This predator has a breeding potential about one-and-one-half times

greater than the white-tailed deer, yet the latter is ten to fifteen times as numerous in spite of heavy hunting pressure.

Micro- and macroscopic examinations of stomach contents, fecal matter, and droppings reveal the bobcat to be host to many parasites. The majority of these parasites have been reported by other workers but several new endoparasites have been discovered during the course of this investigation.

Since nearly 100% of all bobcats examined were parasitized to some degree, the writer believes a high percentage of kittens die in their dens when they become infested with endoparasites. One observed litter was eliminated in this manner. Diseases also seem to take a toll of both juvenile and adult bobcats. In captivity many adults succumb to distemper, and it is definitely known that rabies spread into wild populations.

13. The Effect of Red Fox Populations on Other Game Species.

F. Nelson Swink; *Virginia Cooperative Wildlife Research Unit, Virginia Polytechnic Institute.*

This study was carried out on 2300 acres of farm land in Montgomery County in southwestern Virginia. The data presented were collected over a period of eighteen months by field observations and by analysis of 550 droppings to determine the pressure placed by this predator upon some of the common farm game species. Other life history data are included as they relate to this problem.

The red fox population on the study area was high at the time and afforded the investigator ample opportunity to make a number of close observations. Evidence shows that predation on bob-white quail is negligible, while predation pressure on the cotton-tail rabbit is high and apparently fairly constant. Mice and rabbits make up a majority of the diet, with seasonal items reaching peaks at different periods of the year to supplement the diet.

14. Sex and Age Ratios in the Muskrat.

Mitchell A. Byrd; *Virginia Cooperative Wildlife Research Unit, Virginia Polytechnic Institute.*

Sex and age ratios may be advantageously collected and utilized in determining population phenomena. Daily trapping season sex ratios indicate that an inverse relationship between trapping intensity and the proportion of males in the catch exists. Age ratios may also be used as indicators of trapping intensity, since a high juvenile: adult ratio denotes overtrapping the preceding year. Age ratios indicated that trapping in Montgomery County, Virginia, ranged from moderate to intensive on the twelve streams which were kept under close observation.

Sex and age are most easily determined in the muskrat by an examination of the external genitalia of the animals. Should the carcass not be available, ages may be fairly accurately determined by an examination of the primeness pattern of the pelts. Sex may also be determined from the pelts by noting whether mammary glands are present or absent.

15. High Occurrence of *Taenia taeniaformis* in the Muskrat.

Mitchell A. Byrd; *Virginia Cooperative Wildlife Research Unit, Virginia Polytechnic Institute.*

Examination of livers from 54 muskrats taken from a small stream in Montgomery County, Virginia, showed 35.2% to be infected with the strobilocercus form of *Taenia taeniaformis*. No host-intermediate host relationship was established However, the regular occurrence of the parasite in both sub-adult and adult animals indicates the predation on muskrats by some carnivorous species though such predation was not observed.

16. Drosophilidae in a Southwest Virginia Woods.

Max Levitan; *Virginia Polytechnic Institute.*

Collections of *Drosophila* were made in an oak-hickory woods near Blacksburg, Virginia, between the last week of April and the second week of November in 1950 and 1951. Banana mash bait was used in Mason jar traps at constant locations. Twenty-eight species were obtained, twenty-four of the genus *Drosophila*. The more common species showed extensive seasonal fluctuations in numbers, the main factors responsible apparently being temperature and interspecific competition. The *affinis* complex, *transversa*, and *putrida* are most common in the spring; the *melanicas, robusta, tripunctata*, and the cosmopolitan species are most common in the summer and fall. *Transversa* and *putrida* show a second peak in July. Whether the *affinis* complex is common in late August and early September appears to depend inversely on the density of *immigrans* and *busckii* at the time. The species also seem to differ in their tertiary sex ratios.

17. An Annotated Check List of the Flora of Virginia.

A. B. Massey; *Virginia Polytechnic Institute.*

A check list is being developed as a preliminary to a State Flora. This paper presented plans and progress with the monocotyledons. The annotations in the preliminary list included only authenic records in botanical literature.

Minutes of the Chemistry Section [5]

W. SCHUYLER MILLER, *Chairman*

HENRY LEIDHEISER, JR., *Secretary*

WILLIAM E. TROUT, JR., *Section Editor* (1952)

FRIDAY, MAY 16—9:00 A. M. AND SATURDAY, MAY 17
VIRGINIA ROOM

INTRODUCTORY REMARKS. Chairman W. Schuyler Miller; *Randolph-Macon College, Ashland.*

1. Equilibria in Solutions of Complex Ions.

James W. Cole, Jr., John Y. Mason, and Lewis G. Cochran; *University of Virginia.*

An understanding of the equilibria in systems containing an "elementary" ion, an aqueous solvent, and a complexing agent for the ion, is important in many phases of chemistry. The experimental data are meagre on the action of the solvent, and consequently the assumptions often made lead to uncertain conclusions as to the nature of the complex ion. The present discussion will bring out some of the difficulties encountered with aqueous systems containing copper II ions and complexing agents of the amine and ethanolamine types.

2. Titania Col.

Paul D. Webster, III and William E. Trout, Jr.; *University of Richmond.*

In the course of preparation of titania xerogels for use in adsorption studies, it appeared desirable to learn more concerning the conditions under which titania jelly (hydrogel) forms. This paper reports preliminary studies of the effect of concentration and pH on the nature of the jelly obtained by addition of potassium carbonate to an aqueous solution of titanium tetrachloride. Seventy-two jellies, sols, and gelatinous precipitates were prepared. Although the limits are not sharp, it was found that relatively clear, rigid, vibrant jellies of uniform appearance and ability to retain their structure during washing were obtained at pH values between 1.78 and 1.90 and concentrations between 0.55 and 1.1 moles per liter expressed as titanium dioxide.

3. Recent Studies of Phosphonic Acids of Biological Significance.

Alfred Burger, Norman D. Dawson, Frank L. Sawyer, and Beverly E. Smith; *University of Virginia.*

It has been shown that Grignard reagents react with dialkylaryl phosphonates by an addition reaction in which a complex is formed

which then reacts further with the Grignard reagent. The complex can also be obtained by solvating the ester with magnesium bromide in dry ether.

The Arbusov reaction with benzhydryl bromide furnishes esters of diphenylmethane phosphonic acid which could be hydrolyzed in stages to the mono-ester and to the free acid. The free acid could be re-esterified with diazomethane.

Diphenylphosphinic acid can be converted to a number of anilides substituted by halogen in the aromatic ring. It was also transformed to its diethylaminoethylamide and its novaldiamide. Similar reactions have been initiated with its *p*-chloro derivative.

4. Iodometric Determination of Ascorbic Acid in Citric Juices as a Student Exercise.

Alfred R. Armstrong; *College of William and Mary.*

For the past four years each student in the beginning class in volumetric analysis has titrated 5.00 ml samples of strained grapefruit, orange, and lemon juice with 0.01136 N iodine solution (1 ml=1 mg ascorbic acid, Vitamin C).

The juice of 24 grapefruit, 28 oranges, and 28 lemons has been titrated. The grapefruit juice averaged 42 mg. ascorbic acid per 100 ml., orange juice 50 mg. per 100 ml. and lemon juice 54 mg. per 100 ml. Few grapefruit or lemons had juice varying from the average by more than 5 mg. per 100 ml.; the values for the oranges were distributed rather evenly over the range 30 to 70 mg. per 100 ml.

The six canned and frozen juices tested had ascorbic acid content equal to or greater than the average of the fresh fruit.

There was little loss of ascorbic acid in juices in open beakers for three hours in the labortory or 24 hours in a refrigerator.

5. Reactivity of Alkyl Halides in the Michaelis-Arbuzov Reaction.

J. Roger Mangham and Charles L. Harowitz; *Virginia-Carolina Chemical Corporation.*

Alkyl halides react with trialkyl phosphites to yield dialkyl alkylphosphonates in accordance with the general equation:

$$(RO)_3P + R'X \rightarrow (RO)_2P(O)R' + RX$$

Reactions of this type have been utilized in the preparation of six new phosphonates and diphosphonates from a variety of alkyl and alykaryl halides. The esters prepared have a wide range of physical and chemical properties. Findings confirm the order of reactivity of the alkyl halides as $RI > RBr > RCl$, the same as found in ordinary substitution reactions. Rates of reaction of the phosphites generally decrease as the complexity of the ester groups increase.

Generally speaking, alkyl iodides react readily upon gentle heating and may, indeed, in some cases require cooling to modulate the vigorous reaction which ensues after an induction period. Yields are generally good. Alkyl bromides usually react smoothly at temperatures around 150° to give satisfactory yields of phosphonate esters. In the case of alkyl chlorides reaction temperatures up to 200° may be required with yields in most cases being poor. Benzyl type chlorides, on the other

hand, react more readily and are more nearly comparable in type to the alkyl bromides.

Dihalides in which the halogens are separated by two or more methylene groups behave in an analogous fashion to the monohalides.

6. The Load-Elongation Properties of Freshly Precipitated Zein Fibers.

J. S. Gillespie, Jr. and Herschel S. Jenkins; *Virginia-Carolina Chemical Corporation.*

The mechanical properties of freshly coagulated zein fibers spun from aqueous alkaline solutions by the usual wet-spinning technique have been determined using a simple laboratory device for measuring the elongation of the fibers under an applied load in liquid baths. The influence of several variables in the spinning process has been studied. The variables considered were:

(1) the degree of denaturation of the zein in the aqueous alkaline solutions, as measured by the viscosity;

(2) the reaction of formaldehyde, a widely-used protein hardening agent, with the zein figers;

(3) the medium in which the fibers were elongated.

Correlations between the measurements and the structure of the fibers have been suggested.

Southern Pine Bark—A Potential Raw Material.

J. Lawrence McKenna[1]; *Holy Cross Academy; Lynchburg.*

7. The Reaction of Amines With Various Substituted Benzoins.

Joseph W. Baker and Robert E. Lutz; *University of Virginia.*

Previous investigations have shown that in the Voigt reaction of primary aromatic with isomeric benzoins, such as 4-methoxybenzoin and 4'-methoxybenzoin, each benzoin gives only one α-mino ketone. It was postulated that the initial attack by the amine is on the carbonyl group followed by ketonization to the amino ketone.

When primary aliphatic amines, such as benzylamine, butylamine, and ethanolamine, were used it was found that either or both possible isomers were obtained depending upon reaction conditions. As with aromatic amines the initial attack was on the carbonyl, but under the reaction conditions it was possible to rearrange the unstable to the stable amino ketone where the carbonyl group is stabilized by resonance.

Contrary to previous reports it was found that secondary amines, such as benzylmethylamine and ethylethanolamine, would also react with benzoin under more drastic conditions under which the labile benzoin rearranges to the stable isomer before reacting with the amine.

Ultraviolet absorption spectra were used with success in determining the structures of the isomeric benzoins and the amino ketones.

The amino ketones were reduced to the corresponding amino alcohols with aluminum isopropoxide or lithium aluminum hydride. Both

1. Finalist, Virginia Science Talent Search

the amino ketones and the amino alcohols were submitted for testing for carcinolytic activity.

8. Some New Organic Reagents for the Colorimetric Determination of Trace Quantities of Boron.

Everett C. Cogbill and John H. Yoe; *Pratt Trace Analysis Laboratory, University of Virginia.*

A spectrophotometric study has been made of five derivatives of the dihydroxyanthraquinones, anthrarufin, and chrysazin as colorimetric reagents for boron. The compounds studied are: diaminoanthrarufin (1,5-diamino-4,8-dihydroxyanthraquinone) (I); diaminochrysazin (1,8-diamino-4,5-dihydroxyanthraquinone) (II); the corresponding dinitroanthrarufin (III), and dinitrochrysazin (IV); and tribromoanthrarufin (V) (position of substituent bromine atoms uncertain). These compounds give color reactions with borate in concentrated sulfuric acid solution.

The wavelengths of maximum absorption of the colored boron complexes and the spectrophotometric sensitivities (micrograms B per cm.) for the five reagents are; I, 620 mu, 0.0021; II, 495 mu, 525 mu, 0.0016 (525 mu); III, 505 mu, 0.0017; IV, 490 mu, 0.0053; V, 637 mu, 0.0008. The practical detection limits, spectrophotometrically with 1 cm. cells, are approximately 1 part of boron in 50,000,000 parts of solution for the diamino and dinitro-anthrarufins and the diaminochrysazin, 1 part in 20,000,000 for the dinitrochrysazin, and 1 part in better than 100,000,000 for the tribromoanthrarufin.

From the standpoint of widest separation of the absorption bands of the reagent and its colored boron complex, the diaminoanthrarufin is the best of these reagents, and it has been investigated in more detail than the others. A solution of this reagent in sulfuric acid is yellow (absorption maximum, 435 mu); that of its boron complex is dark blue. Light absorption by the reagent itself drops to a very low value at wavelengths above 500 mu, being less than 2% of that of its boron complex at 620 mu. The color reaction is reproducible, and the color follows Beer's Law over the range 0 to 0.3 ppm of B, deviating slightly at boron concentrations above this limit. Al^{+++}, Ca^{++}, K^{+}, Mg^{++}, Na^{+}, and PO_4^{---} do not interfere; ferric iron at ratios of approximately 100 Fe^{+++} to 1 B gives results about 10% high. Fluoride decolorizes the boron complex and interferes seriously, as little as 0.009 mg. F^{-}/ml reducing the color density of a 0.5 ppm B solution by 50%.

9. The Use of Radioactive Phosphorus in Studying the Loss of Phosphate in Ashing Human Blood.

Ralph E. Thiers; *Pratt Trace Analysis Laboratory, University of Virginia.*

Radioactive P^{32} was added to 10 ml. samples of human blood which was then ashed by conventional wet and dry methods. The volatile products were caught and the activity of various fractions measured in order to ascertain if a loss of phosphorus occurred. Such a loss would, of course, make invalid an analysis of blood ash for phosphate. In the case of wet ashing approximately one-quarter of the phosphorus was lost from the ash but in the case of dry ashing, less than 0.1% was lost.

10. Application of the Selective p-Nitrosophenylamine Group in the Trace Analysis of Several of the Platinum Metals.

J. J. Kirkland; *Pratt Trace Analysis Laboratory, University of Virginia.*

A colorimetric "additive absorbancy" method involving the use of the Pt and Pd complexes of *p*-nitrosodimethylaniline is reported for the determination of trace amounts of the two metals without the usual need of separation. Mixtures of Pt and Pd in relatively large ratios can be analyzed using this technique. Separation of Pd from Pt by extraction of the Pd-*p*-nitrosodimethylaniline into chloroform permits the determination of mixtures containing very large Pd to Pt ratios. Rhodium interferes with this "additive absorbancy" method and must be absent. The intense red color of the Rh-*p*-nitrosodimethylaniline complex suggests that it might be used in a trace method for this metal. Other compounds containing the *p*-nitrosophenylamino group also react with both Pd and Pt under certain conditions.

11. Spectrophotometric Studies of Metal Complexes of 2-Hydroxy-5-sulfo-2'-carboxyformazylbenzene.

Richard M. Rush; *Pratt Trace Analysis Laboratory, University of Virginia.*

This paper is a continuation of an investigation reported last year and discusses the use of the compound 2-hydroxy-5-sulfo-2'-carboxyformazylbenzene for the colorimetric determination of copper and of copper and zinc in the presence of each other. The reagent forms a dark red solution and a soluble deep blue complex with both copper and zinc. The practical sensitivity is the same for both elements, 1 part in 50,000,000. The two complexes are separated by the difference in the effect of pH. At pH 9 both of the complexes absorb at 600 bu. At pH 5 only the copper complex absorbs at this wavelength. Thus it is possible to determine the copper directly by measuring the absorbancy at pH 5 and to determine the zinc by subtracting the absorbancy at pH 5 from that at pH 9.

BUSINESS MEETING

A nominating committee consisting of Robert H. Kean, Lynn D. Abbott, and William E. Trout, Jr. nominated the following candidates as officers of the Chemistry Section for 1952-53:

Chairman—Henry Leidheiser, Jr., Virginia Institute for Scientific Research

Secretary—Robert C. Krug, Virginia Polytechnic Institute

Section Editor—Carl J. Likes, Virginia Institute for Scientific Research

These officers were elected by a unanimous vote of the members present.

12. Further Evidence for the Mesomeric Effect in Organo Fluorine Compounds.

F. A. Vingiello, J. G. VanOot, and H. H. Hannabass; *Virginia Polytechnic Institute.*

In connection with our studies on the mechanism of aromatic cyclodehydration we have encountered an interesting example of the important part the mesomeric effect can play in reactions involving fluorine compounds. After a short introductory discussion of the mesomeric effect, we will explain how we have correlated our data with this known effect.

The experimental work consists of the synthesis of six new substituted 2-benzylbenzophenones and the cyclization of these ketones to their corresponding anthracenes. The specific rate constants for each of the cyclizations has been measured.

13. Spectrophotometric Studies of Mercaptoacetic Acid as a Colorimetric Reagent for Molybdenum.

Fritz Will; *Pratt Trace Analysis Laboratory, University of Virginia.*

Mercaptoacetic acid gives a yellow color with molybdate ions. This color formation is the basis for the colorimetric determination of molybdenum, which has been established by studying the effect of certain variables on the molybdenum mercaptoacetate colored complex. Also, the determination of both iron and molybdenum in the same aliquot solution may be made with the reagent when the optimum pH and wavelength are used for each.

14. Kinetic Proof of a Schiff Base Intermediate in the Amine-Catalyzed Condensation of Piperonal with Nitromethane.

Thomas I. Crowell and David W. Peck; *University of Virginia.*

The condensation of an aromatic aldehyde with nitromethane, to form the β-nitrostyrene, is often catalyzed by amines. The work reported here shows by means of reaction kinetics that when *n*-butylamine or *n*-butylammonium acetate is the catalyst, the Schiff base appears as an intermediate.

Piperonal and butylamine form the Schiff base (3,4-methylenedioxy benzalbutylamine) in a rapid second-order reaction which does not require acid catalysis. The reaction of piperonal with excess butylamine acetate follows a first order course.

The Schiff base was prepared and found to react with nitromethane. Second order kinetics are obeyed provided conditions are such as to favor the nitrostyrene product in the equilibrium.

The calculated rate of formation of nitrostyrene, assuming Schiff base formation followed by condensation, is in agreement with the experimentally determined rate of formation of nitrostyrene from piperonal. The induction period of this reaction varies with concentration as expected. The reasons for the effectiveness of ammonium acetates as catalysts are discussed.

15. Isolation Studies of Antibiotic Principles of the Cresote Bush, *Larrea divaricata*

Lowell V. Heisey and Wayne Ardinger; *Bridgewater College.*

Nordihydroguaiaretic Acid (N.D.G.A.) has been listed by Tsuchuja *et al.* (*J. Bact.*, 47, 422 (1944) as the antibiotic principle of the Cresote Bush, *Larrea divaricata*, Cav. The present authors have obtained several inhibition zones in paper disc bacterial assays with *Bacillus subtilis* as the test organism, which indicates the presence of possibly more than one antibacterial agent.

This paper describes the authors' work in separating and identifying these active antibacterial components. Chemical tests indicate that all of the active materials are o-dihydroxybenzene derivatives. The most active one appears to be N.D.G.A., and progress on the identification of the others is discussed.

16. The Reduction of Organic Compounds of Sulfur by Metals in Liquid Ammonia.

Robert C. Krug and Stanley Tocker; *Virginia Polytechnic Institute.*

The reduction of several representative compounds containing carbon, sulfur, and hydrogen is described. The fate of the carbon to sulfur bond in saturated and unsaturated sulfides and thiophene is ascertained in the presence of different metallic reducing agents in liquid ammonia in the presence of varying concentrations of proton donor. The extent and course of reduction are determined by systematic analyses specifically developed for each type of compound. The data obtained are reviewed for a correlation between the reducing power of the metal, the concentration of the proton donor, and the relative ease of cleavage of the carbon to sulfur bond. A mechanism of reduction consistent with the experimental evidence is presented.

17. The Anomalous Action of Ethylmagnesium Bromide on Di-isobutyl Ketone.

Robert C. Krug, Warren L. Choate, Joseph T. Walbert, and Robert C. Leedy; *Virginia Polytechnic Institute and Washington and Lee University.*

The action of the simpler Grignard reagents on branched chain ketones, where the branched groups are in the beta position or farther from the carbonyl group, yields the expected addition products which after hydrolysis give the tertiary alcohols. The attack of ethylmagnesium bromide on di-isobutyl ketone reveals an unexpectedly complex action. Extensive reduction and enolization of the ketone occurs and the yield of the expected tertiary alcohol is low. This alcohol, ethyldi-isobutyl carbinol, resulting from the reaction of ethylmagnesium bromide and di-isobutyl ketone is described for the first time. The proof of structure of the new alcohol by dehydration and subsequent ozone oxidation of the olefinic hydrocarbons is reported in detail.

18. The Peroxide Catalyzed Addition of Hydrogen Bromide to Methylenecyclobutane.

Robert C. Krug, Louis W. Smith, and Richard M. Yankee, Jr.; *Virginia Polytechnic Institute and Washington and Lee University.*

One of the many interesting reactions in the field of organic chemistry is the so-called abnormal addition of hydrogen bromide to the carbon to carbon double bond. This addition, catalyzed by oxygen or peroxides, is the reverse of that expected on the basis of the Markowinkoff rule. Extensive investigation of the kinetics of this reaction support the theory that this addition proceeds by an atom or free radical mechanism. The present study describes the peroxide catalyzed addition of hydrogen bromide to methylenecyclobutane. This four membered ring system, which may under ionic attack expand to a five membered ring, is found to undergo smooth addition of hydrogen bromide to yield bromomethylcyclobutane. This compound is described for the first time.

19. Aquo Complex Ions in General Chemistry.

John F. Baxter; *Washington and Lee University.*

Modern structural concepts of aqueous cations can be used to account for a large number of phenomena of interest to chemists; e.g., heats of solution of salts; colors of some aqueous ions; crystalline hydrates of the type $Mg[H_2O]_6Cl_2$; analogies with other complex ions; variations in acidities of the ions; results of heating crystalline hydrates; amphoteric (amphiprotic) properties of many gelatious hydroxides; "basic" salts; *etc.* It is contended that since chemists generally agree that most metallic ions in aqueous solution are strongly hydrated, chemistry students should be informed of this. This concept is so generally useful that it is unfair to students to let them believe that, for example, Cu^{++} properly represents cupric ion in aqueous solution but that $Cu[NH_3]^{++}_4$ represents the cupric ion in ammonia solution. Since the concept of an ion such as $Cu[H_2O]^{++}_6$ is quite simple and is in accord with many structural facts, and since it can be used to account for so much useful solution chemistry, it deserves consideration in General Chemistry.

20. Distribution of SO_4^{--} and HSO_4^- Between Aqueous Solution and the Strong Base Anion Exchange Resin Dowex-1.

Cephas Patch and John F. Baxter; *Washington and Lee University.*

Dowex-1 has been prepared in the pure sulfate form. A systematic study has been made of the equilibrium between SO^{--}_4 and HSO^-_4 in the solution phase and the resin phase. The method is to shake weighed amounts of air dried Dowex-1 with measured volumes of dilute sulfuric acid of known concentration and from the uptake of the acid and its ions to calculate how the sulfate and acid sulfate ions are distributed between the two phases. Data are given. This information is necessary to an understanding of sulfate complexes and their exchange with strong base resins.

21. Planning for Science in Virginia.

Allan T. Gwathmey; *University of Virginia.*

Most periods in history have some unique feature: Greece was conspicuous for its democratic government and cultural development; Rome for its military conquests and law; the Medieval Ages for its domination by the Church; and today there can be no doubt that Science is calling the turn of events.

Scientific knowledge is obviously not the key to all problems, but it can be used to accomplish much. It can remove poverty and disease which still stalk the Earth, and it can improve the mind and increase understanding. So far, it has done little more than upset the stable state of affairs, and the chief reason for this is that Science has not yet been integrated into Society or accepted as a way of life. We are now living through the growing pains of the Age of Scisence. Virginia has played very little part in the development or integration of the Age of Science except to help furnish the form of government under which it now may flourish. Perhaps in starting late we can build well on the experience of others.

In order to meet this problem, it is proposed that Virginia must specifically plan to accomplish the following objectives. One, the universities and colleges within the State must increase greatly the number of scientifically trained graduates. They are only a trickle at present. Two, these institutions must also greatly increase their contributions to fundamental scientific knowledge. With a population of three million in the State there are not more than fifteen men who devote more than half time to basic research, our seedbed for future development. Three, local industry must be persuaded to utilize modern research. Four, we must develop more statesmen and business leaders who are keenly aware of the potentialities of science and who can guide the affairs of the State to capitalize on these potentialities. Five, scientific knowledge must be integrated with government, law, religion, and finance so that science can become an integral part of society.

22. Evidence for 1,4- and 1,6-Reductions of *cis* and *trans*-Phenyldibenzoylethylenes.

Robert E. Lutz and Carl R. Bauer; *University of Virginia.*

Cis and *trans*-phenyldibenzolethylenes are reduced by zinc and acetic acid under comparable conditions to mixtures of the saturated 1,4-diketone and furan in widely differing ratios; the *cis*-isomer gives the smaller yield of furan. Taking into account the probable fine structures of these compounds and the probable mechanism of reduction, involving free radical transition states and enolate intermediates, it is concluded that *trans*-phenylidbenzoylethylene undergoes entirely 1,6-reduction and that the *cis* isomer resists this type of reduction and undergoes instead, or also to a very significant extent, 1,4 reduction of the benzalacetophenone system present. The background and related and new work in this field will be considered.

23. The Stereoisomeric Dibromides and *alpha*-Bromo Derivatives of Benzalacetophenone and the Mechanism of Dehydrohalogenation.

Robert E. Lutz, David F. Hinkley, and Robert H. Jordan; *University of Virginia.*

A second and non-crystalline (*cis*) *alpha*-bromobenzalacetophenone has been obtained by sunlight inversion of the known (*trans*) crystalline form. It is formed in small amounts in the potassium acetate dehydrohalogenation of the high-melting benzalacetophenone dibromide but it is not obtained in the similar dehydrohalogenation of the low-melting dibromide. The ultraviolet absorption characteristics and interconversion of the isomers are discussed in relation to configuration. The assignment of configurations to the benzalacetophenone dibromides is made on the basis of differing behaviors on dehydrohalogenation where two competing mechanisms are suggested.

24. Some Amino Ketones and Alcohols Based on the 1,2-Diphenylpropane System.

Rosser L. Wayland and Robert E. Lutz; *University of Virginia.*

β-Amino-α-phenylpropiophenones have been prepared by the Mannich reaction on desoxybenzoin. Some amino ketones of this type have also been obtained by reacting amines with α-chloro-α-phenylpropiophenone through the elimination of hydrogen chloride from the chloroketone followed by conjugate addition of the amine to the α-β-unsaturated ketone formed. These β-amino ketones have been reduced to the corresponding alcohols 3-amino-1,2-diphenylpropanols by lithium aluminum hydride after Ponndorff reduction proved unsatisfactory.

α-Methyl benzoin failed to undergo the Voigt reaction when treated with amines under usual conditions, but gave Schiff bases which could be reduced with lithium aluminum hydride to 1-amino-1,2-diphenyl-2-propanols. These amino alcohols have been shown to have the same configurations as those prepared by the addition of methylmagnesium iodide to α-aminodesoxybenzoins.

2-Chloro-1,2-diphenyl-1-proponal has been prepared by the reduction of α-chloro-α-phenylpropiophenone with lithium aluminum hydride. It reacted with amines to give 2-amino-1,2-diphenyl-1-propanols, but this reaction does not appear to go through an oxide intermediate as is usually the case with amine-chlorohydrin reactions. The amino alcohols prepared in this way have been oxidized to the corresponding ketones using benzophenone and potassium tert-butoxide.

25. Cyclization of *alpha*-Aminoethylamine Ketones.

Carl D. Lunsford, Robert E. Lutz, and E. E. Bowden; *University of Virginia.*

α-Aminoethylamino ketones of the type α-(β-aminoethylamino)-α-phenylacetophenone are not isolated as such, but readily undergo cyclization followed by oxidation and/or loss of water, and yield compounds of the hydropyrazine and piperazine series.

The condensations of ethylenediamine with desyl chloride and of α-(β-chloroethylamino)-α-phenylacetophenone (A) with ammonia yield 2,3-dihydro-5,6-diphenylpyrazine.

Primary amines, for example benzylamine, react with (A) probably given as an intermediate the expected α-(β-alkylaminoethylamino)-desoxybenzoin which readily undergoes cyclization and oxidation and yields a 1-alkyl-2,3-dihydroxy-2,3-diphenylpiperazine (B). Identical compounds are obtained when monoalkylethylenediamines are condensed with benzoin under the Voigt conditions and when α-(β-chloroethyl, alkylamino) -α-phenylacetophenones (C) are condensed with ammonia.

When the alkyl of (B) is benzyl the compound is further autoxidized to monobenzylethylenediamine dibenzamide. (B) is hydrolyzed by dilute acids to benzil and the monoalyklethylenediamine. Reduction by $LiAlH_4$ gives 1-benzyl-2,3-diphenylpiperazine.

The condensations of dialkylethylenediamines with desylchloride or of (C) with primary amines result in aminoketones which undergo cyclization, lose water and yield 1,4-dialkyl-2,3-dehydro-2,3-diphenylpiperazines. No oxidation occurs when the nitrogen is tertiary. When the desylchloride-dibenzylethylenediamine condensation is carried out in ethanol it is possible to isolate an acetal analog, 1,4-dibenzyl-2-ethoxy-2,3-diphenylpiperazine.

26. A Study of the Wetting of Metallic Surfaces Using Large Metallic Single Crystals.

Jerome Kruger; *University of Virginia.*

The degree of wetting can be measured experimentally by determining the angle which a liquid makes with the solid upon which it rests. An angle of 0° indicates complete wetting, 180° non-wetting.

A sessile bubble apparatus was constructed to measure contact angles on a single crystal of copper which had certain crystallographic planes cut on it. This apparatus made it possible to study the change of contact angle with time continuously as long chain polar molecules were being adsorbed on the surface of the crystal from aqueous solutions.

It was found that there exists a difference in contact angles because of the difference in the rate at which tetradecyl amine adsorbs on copper depending on crystallographic plane, the rate for the (100) being greater than that for the (111). At equilibrium, however, the contact angles reach the same maximum value for all faces.

It was also found that atmosphere plays an important role, hydrogen producing a decrease in contact angle over that for air.

These results appear to be consistent with those reported last year for stearic acid and with oxidation studies.

27. The Effect of a Foreign Substance on the Rearrangement of the Surface of a Copper Single Crystal by Reaction of Hydrogen and Oxygen.

R. E. Cunningham; *University of Virginia.*

The rearrangement of a copper single crystal acting as a catalyst results in the development of facets parallel to certain crystallographic

faces, so that after a time the whole crystal surface exhibits only preferred planes. Since catalytic activity varies markedly with fact, this results in an appreciable change of reaction rate in the altered areas.

The presence of small amounts of a foreign substance causes the rearrangement to proceed quite differently in some cases, so that the amount of area developed parallel to the various faces is changed. This is believed to be the mechanism of catalyst promotor action.

28. The Growth of Single Crystals of Iron by the Strain-Anneal Method.

Bruce Wagner, Jr.; *University of Virginia.*

To learn more of the fundamental properties of iron, it is desirable to have massive single crystals.

The conventional method of producing large single crystals of metal is to cool slowly the molten metal so that a single crystal forms in the initial solidification. However, this method is not applicable to iron because of the phase changes which iron undergoes when it is cooled from the molten state. Therefore an alternate procedure must be adopted. This method is the strain-anneal method. It consists of straining the metal thus imparting energy to the system, then annealing at a temperature just below the phase transformation temperature. This allows the energy to dissipate itself in grain growth since the larger crystal will have less surface area than many small crystals and it will be thermodynamically more stable.

The usual method of applying the strain is a one dimensional elongation of approximately three percent. Investigations in this laboratory have shown that a combination of a three percent elongation plus a rotation of ten to fifteen degrees over a two inch section increased the percent yield of single crystals. Using six inch lengths of one quarter inch round Armco iron bar, a fifty percent yield of single crystals one-quarter inch by one inch was achieved.

29. The Effect of Neutron Bombardment on the Electrical Properties of Semiconductors.

F. W. Young, Jr.; *University of Virginia.*

Lattice disorder in bulk Ge produced by collisions of fast neutrons with lattice atoms introduces a net excess of electron traps or acceptor states, which appear to have an energy distribution in the forbidden band. Bombardment of N-type Ge causes the conductivity to decrease, initially at a uniform rate, to a minimum value and then to increase. Examination of the data shows that initially about 3.2 conduction electrons are removed per incident fast neutron. The minimum value of the conductivity is higher than the value calculated assuming complete homogeneity and thermal equilibrium. Hall effect measurements prove that after the minimum is passed the material has been converted to P-type by fast neutron bombardment. The conductivity of P-type Ge increases with bombardment. The rate of increase decreases monotonically indicating an approach to saturation. The initial rate of carrier introduction in P-type Ge appears to be temperature dependent, being greater at higher temperatures and smaller than the rate of carrier removal for N-type Ge which is apparently temperature independent in

the temperature range investigated (-79°C to 45°C). The effect of lattice disordering on the electrical properties of Ge may be removed by careful vacuum annealing at 450°C while a portion of this effect readily anneals at room temperature.

30. Some Recent Studies with the Electron Field Microscope of the Mueller Type.

Peter Burum Sherry; *University of Virginia.*

Cold electron emission from metal surfaces is being used to study the nature of surface reactions. Fields of approximately 10 volt per cm. are attained by pointing fine metal wires. Magnification of the order of 10^6 to 10^7 is possible with theoretical resolving powers of 2 to 3 A°.

Substances deposited on metallic surfaces can be studied with regard to areas of adsorption and surface migration. With information gained from this type of experiment, it is hoped that the role of crystallographic direction in metal surface reactions may be better understood.

31. Susceptibility of Aluminum to Mercury Corrosion.

Virgil E. Straughan; *Virginia Institute for Scientific Research.*

The fast rate of oxidation of metallic aluminum is not obvious to the naked eye owing to the formation of a highly protective oxide film. The reactivity of aluminum may be vividly demonstrated, however, by subjecting a clean aluminum surface in the presence of oxygen or air to droplets of mercury at room temperature. The oxide film is permeated by mercury at points of imperfections with the result that uncontrollable oxidation occurs. Voluminous quantities of aluminum oxide appear in a matter of minutes. The corrosion product is undoubtedly aluminum oxide although x-ray diffraction studies showed the aluminum oxide to be amorphous. A possible explanation is that the process is a continual dissolving or amalgamating action of the mercury on the aluminum. The aluminum of the amalgam is used up by oxidation and replenished again and again at the aluminum surface.

32. Molecular Dimensions of Zein from Intrinsic Viscosity Data.

Carl J. Likes; *Virginia Institute for Scientific Research.*

As a preliminary study to an ultracentrifugal project, the density and viscosity of zein solutions were investigated over a temperature range extending from 20° to 28°C and over a composition range extending from the pure solvent (85 percent aqueous iso-propyl alcohol) to 1.5 weight percent zein. The densities were determined with a specific gravity bottle of the Weld type and the viscosities with an Ostwald viscosity pipette of the Fenske-Cannon modification. A kinetic correction term was included in the calibration equation for the viscometer. The partial specific volume of zein was computed from the density data and found to be approximately 0.772 cubic centimeter per gram. The viscosity data yielded a value of 15.4 for the weight intrinsic viscosity and a value of 19.9 for the volume intrinsic viscosity. Assuming

the shape of the zein molecule to approximate that of a prolate ellipsoid of revolution, the axial ratio (major to minor axis) was calculated by means of Simha's equation and found to be 13 to 1. Perrin's equation yielded a value of 1.7 for Svedberg's frictional ratio. Combining this result with a value of the sedimentation constant for zein reported in the literature, the molecular weight was computed to be 36,000 grams per mole, and the length and breadth of the molecule to be 247 A° and 19 A°, respectively.

33. The Disintegration and Dissolution of Urinary Calculi.

L. W. Claffey and D. W. Levi.; *Virginia Polytechnic Institute.*

Concentrated hydrochloric acid is a good "in vitro" solvent for urinary calculi. Hydrochloric acid (0.4%) causes extensive disintegration of some calculi on 12 hour irrigation. Pretreatment with 0.5% solutions of hyaluronidase or streptokinase-streptodornase for one hour, the experimentally determined optimum time, leads to extensive disintegration and dissolution of most phosphate and carbonate type calculi on subsequent irrigation with 0.4% hydrochloric acid. Urease also functions as an aid to dissolution but seems to somewhat less effective than hyaluronidase or streptokinase-streptodornase.

34. A New Type of Polarograph.

B. W. Mundy and W. W. Allen; *Virginia Military Institute.*

The problem in any recording polarograph is to record the current as a function of the emf applied to the electrolysis cell.

The application of an increasing emf to the electrolysis cell was accomplished in the following manner. Resistance wire in the form of a U. one arm twice the length of the other, was placed in a U-tube of glass. The desired maximum emf was applied across this resistance wire. At the mid-point of the long arm of resistance wire a lead wire was tapped off. The electrolysis circuit, consisting of the cell and a reflecting galvanometer, was connected across a lead from the top of the long arm and the lead from the mid-point of the same arm of resistance wire. Initially, mercury filled the long arm of the glass tube and was separated from the short arm by a stopcock. By means of the stopcock mercury was allowed to flow into the short arm of the glass tube, thus uncovering the resistance wire in the long arm and covering it in the short arm. This resulted in the application of an increasing emf to the electrolysis circuit, varying from zero initially to the maximum at the completion of the run.

The light reflected from the galvanometer played on the slit of a light tight box in which was located a wheel upon which photographic paper was mounted. The wheel was rotated by means of a pulley arrangement. A weight from the pulley floated on top of the mercury in the long tube, as the mercury fell the weight fell rotating the wheel. This results in a polar type of polarogram where θ, the angle of rotation from the initial position, is proportional to E, and r is a measure of i.

35. Determination of Transition and Fusion Points by the Method of Differential Thermal Analysis.

O. L. Updike, Jr. and Lewis B. Johnson, Jr.; *University of Virginia.*

The experimental procedure consists of heating the sample side by side and in the same furnace with an inert reference material, and measuring the temperature difference between the sample and the reference material as well as the actual temperature of the sample, both as a function of time. When a phase change involving absorption or evolution of heat occurs, the temperature difference between the reference material and the sample increases; after the transition is complete the temperature difference decreases. Thus each transition produces a peak in the temperature-time curve.

The essential parts of a differential calorimeter are the furnace, the cells in which are placed the sample and reference material, the accessories for controlling and measuring the heating rate, and the thermal elements for measuring the temperature difference between the sample and the reference material.

Brief studies have been made thus far with only a few salt mixtures. However, the results obtained are consistent with the known limitations of the method.

36. Physical and Chemical Properties of Hydrogen Peroxide and Hydrogen Peroxide-Water Mixtures. I. Dielectric Constant Measurements.

Paul Gross, Jr. and John D. Floyd; *University of Virginia.*

In connection with the broad problem of theoretical interest as to the structure of liquids of high dielectric constant such as water and hydrogen peroxide, an investigation is under way of various physicochemical properties of mixtures of water and hydrogen peroxide among which are their solvent properties and dielectric constants. Determinations of the dielectric constants of these mixtures over a wide range of temperatures indicates the possibility of cooperative hydrogen bonding between water and peroxide molecules to form highly polar aggregates. The very high dielectric constants of these mixtures make them of unusual interest for the study of various solution properties.

37. Physical and Chemical Properties of Hydrogen Peroxide and Hydrogen Peroxide-Water Mixtures. II: Solubility of Inorganic Salts.

Paul Gross, Jr. and John D. Floyd; *University of Virginia.*

Methods and techniques have been worked out for solubility determination of salts in hydrogen peroxide-water mixtures. The solubilities of NaCl, $NaNO_3$, KCl, KNO_3, and K_2SO_4 have been determined at 25°C over the entire concentration range of mixtures from 0% hydrogen peroxide-100% water to approximately 100% hydrogen peroxide-0% water. It has been found that all of the potassium salts so far investigated increase in solubility as the solvent mixture becomes richer in

hydrogen peroxide. For the sodium salts thus far determined, the reverse is true, the sodium salt becoming less soluble as the solvent medium is enriched with hydrogen peroxide.

Limited theoretical conclusions have been drawn from the data thus far obtained as to the problem of solvation of these salts by the hydrogen peroxide molecule.

38. Some Compounds of Trivalent Nickel.

G. P. Smith, L. D. Dyer, and B. Borie; *Oak Ridge National Laboratory.*

A new compound of trivalent nickel, $NaNiO_2$, has been prepared and its properties studied. The crystal structure of the previously known compound, $Ni_2O_3 \cdot H_2O$, has been determined.

39. The Action of a Molten Metal on Copper.

J. V. Cathcart and G. P. Smith; *Oak Ridge National Laboratory.*

The habit form of copper crystals grown from molten metal solutions is described. Two mechanisms for mass transfer during the growth process are suggested. The shape assumed by a copper crystal placed in contact with a molten metal solution saturated with copper is described. Under the conditions used in these latter experiments, facets were formed on the surface of a copper single crystal sphere. Thus far facet faces consisting of (111), (100), (110), and (210) planes have been identified.

40. A Thermostat for Temperatures Approaching the Softening Point of Pyrex.

W. H. Bridges, J. V. Cathcart, and G. P. Smith; *Oak Ridge National Laboratory.*

A thermostat operating at temperatures approaching the softening point of Pyrex glass is described, together with the necessary controls and auxiliary pyrometeric equipment. The choice of thermostating fluid, stirring system, and control apparatus is considered, and operating characteristics under various conditions are given.

Minutes of the Section of Education [6]

Z. T. KYLE, *Chairman*

JACK BOGER, *Secretary*

FRANCIS G. LANKFORD, *Section Editor* (1952)

1. The Development of Pupils' Mathematical Concepts[1].

Joseph N. Payne; *Lane High School, Charlottesville.*

A diagnostic interview was held with each of 57 pupils in grades eight and nine of six Virginia High Schools in May, 1951. Twelve were taking first course algebra at the time of the interviews. These had completed general mathematics in grade eight. The remaining 45 were taking eighth grade general mathematics at the time of the interviews.

The interviews were based on 59 questions; 18 of these dealt with the topic of angles, 15 with percentage, and 26 with fractions. The questions were designed to ascertain the extent to which pupils had acquired an understanding of basic concepts related to these three topics.

Among the 38 specific conclusions made from the interviews, these are especially significant.

1. Only five of the 57 students had the concept that an angle is determined by the amount of rotation of the line moving around another line.

2. In general, the students had difficulty in explaining the meaning of per cents. The students seemed to show that they were following a rule blindly in the solution of the various percentage problems. Often a pupil was able to solve a problem correctly but was unable to answer a simple question relative to the concept involved.

3. The pupils exhibited only a fair understanding of the meaning of a fraction. For example, more than one-third could not pick the larger of the fractions, 2/5 and 4/5.

4. There was considerable variation among the pupils from the six schools. Those from one school were much superior to those from the other five in their understanding of angles. The pupils from another school showed marked superiority in their understanding of per cents and fractions.

2. Adjustment Problems of College Freshmen.

Eva C. Mitchell; *Hampton Institute.*

This is a study of adjustment problems submitted by 244 freshmen students who had completed one semester of college work at Hampton Institute. In addition the students had completed one semester hour of an orientation course which was "designed to help students choose a life's work in which he has an abiding interest and special aptitude."

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1. Payne, Joseph N. **The Development of Pupils' Mathematical Concepts.** M. Ed. Thesis, University of Virginia, 1951.

A single page inquiry form was used to collect data on general educational background and vocational plans and also for writing problems—social, emotional, vocational, and curricular—which disturbed the student.

An analysis of the problems submitted by the freshmen indicated that uncertainty concerning vocational choices predominated. Other problems of major concern were those related to personality, improper study habits, adjustment to college, and inadequacy of background.

Percentile comparison of selected categories of problems submitted by Hampton Institute freshmen and those derived from a checklist study by Wrenn of more than 500 college freshmen showed marked variations. While vocational and personality problems seemed more prevalent among Hampton students, problems of finance and those related to study habits seemed more acute among freshmen studied by Wrenn.

Consideration of groups of problems submitted by a single individual revealed the multiplicity of difficulties other than intellectual which might retard a student's progress through college.

3. Report of Teaching Success of Recent Graduates of Radford College as Measured by (1) Supervisor's Evaluation and (2) Graduates' Self-Evaluation.

Minor Wine Thomas; *Radford College, Radford.*

This paper is a brief report of an attempt by the faculty of Radford College to determine the greatest weakness in its program of teacher education. It reports one part of the faculty study, in cooperation with other state colleges, to improve the program of teacher education.

The plan of the study was to evaluate the teaching success of recent graduates first by competent persons in supervisory positions, and secondly, by the graduates themselves.

The method used was a questionnaire containing twenty-five items indicative of teaching success in the general areas of (1) academic or subject matter background, (2) professional skills and attitudes, (3) breadth of understanding of social problems, and (4) personal attributes. The ratings were (1) above average, (2) average, (3) below average.

All of the Radford College graduates from the year 1945 to 1949, who were teaching in Virginia at the time, were evaluated by (1) supervisors and (2) self-evaluation.

Findings: In general the two ratings agree that the greatest strengths are in the academic and personal attributes, and the relative weakness is in professional skills and attitudes. The faculty believes that our greatest need is in improving the Professional Program rather than in the field of General Education.

4. Simple Remedial Reading Technique for Use with Adults and College Students.

Austin E. Grigg; *University of Richmond, Richmond.*

An abbreviated remedial reading program suitable for use with college students and other adult groups is described and results obtained with the method on two samples are given to show the effectiveness

of the method. One group averaged 242 words per minute at the beginning of the therapy and closed their remedial training with a reading rate of 430 words per minute and perfect comprehension. Another group, composed mostly of school teachers, read at rate of 311 words per minute before therapy and averaged 495 words per minute with perfect comprehension after completion of the brief program. When this group was tested 22 days later, without additional training or practice, they were found to average 495 words per minute. This suggests that the reading gains obtained from the program are permanent. A critique of the program made by those who participated is discussed at length.

5. Education's Role in Resource Use Training.

Joseph J. Shomon; *Division of Education, Virginia Commission of Game and Inland Fisheries.*

The natural resources of America are vital to its defense and to its free institutions. Our future lies in the way we manage our geologic and living resources, including the ways of man.

Our natural resources are dwindling. Only an aroused citizenry and a long range program of restoration and wise use can reverse the trend.

Leadership is needed to inform the American public of our resource status, and education is needed to instill fundamental conservation concepts so that wise use can be made an established social practice.

The science educator's role in wise resource use training is an important one. Certain basic concepts must be taught in education. Programs should be aimed largely at the youth.

Mistakes in resource use education have been made. They can be obviated. New approaches are needed. More resource use training is needed in the schools and qualified teachers must be trained to do the training. Pre-service and in-service teacher training in badly needed.

Adequate resource use training in Virginia presents a real challenge to the science educator. While some progress has been made, the overall picture is disappointing. Great progress can be achieved, however, with proper leadership and by a unified approach to the whole problem of resource use education by all conservation agencies, educators, and interested groups and individuals.

6. Some Factors Relating the Success of Richmond College Students to Their High School Preparation.

William Trausneck; *Patrick Henry School, Martinsville.*

In making this study, an answer was sought to the three basic questions which follow: (1) What is the relationship of size and kind of secondary school to academic success in college? (2) What is the relationship between academic rank of a student in his high school graduating class and his academic rank in college? (3) What is the relationship between courses a student pursues in high school and his academic success in college?

The Freshmen Class entering in the session 1938-1939 was selected to represent the pre-war period, and the class entering in the session 1948-1949 was chosen to represent the period since the close of World War II. The information studied in this paper was extracted from the

official records of 225 entrants in 1938 and 320 students who entered in 1948.

This study has revealed that for the two entering classes of Richmond College students separated by a ten year interval, in which World War II was fought, there were some instances where high school academic preparation appeared to be linked with academic success is college. In all classifications of high schools, a tendency to fluctuate in the relative ranking of their respective students in college over this ten year interval was noted.

Minutes of the Section of Engineering [7]

B. A. NIEMEIER, *Chairman*

V. G. SZEBEHELY, *Secretary*

N. F. MURPHY, *Section Editor*

FRIDAY, MAY 16—9:30 A. M. AND SATURDAY, MAY 17, 9:30 A. M. CHAMBERLIN ROOM

1. **Investigation of Subsonic Boundary Layer Effects on Supersonic Airfoils.**

Charles D. West and Robert W. Truitt; *Virginia Polytechnic Institute.*

The present interest in aerodynamics is centered on the transonic and supersonic aerodynamic characteristics of thin, sharp airfoils. With few exceptions, the theoretical and experimental investigations have been made for the transonic and purely supersonic range. Consequently, the observed phenomena exhibited by the experimental data has, for the most part, been interpreted as characteristic transonic and supersonic phenomena. There is considerable well-established theoretical evidence that some of the more important characteristics of the pressure distributions, that have been attributed to compressibility, are actually low-speed viscous effects. However, there is no theoretical solution that takes into account both the viscous and high-speed phenomena simultaneously. In the present paper, an experimental investigation is made of the viscous, incompressible flow phenomena as it effects the pressure distribution over thin, sharp, two-dimensional supersonic type airfoils. A critical review is made of existing theoretical investigations to show that the observed center-of-pressure shift and subsequent change in basic pressure distribution is, at least, partially due to low-speed viscosity.

2. **The Second Coefficient of Viscosity Based upon the Reaction Rate Theory.**

D. Frederick; *Virginia Polytechnic Institute.*

An expression is derived for the second coefficient of viscosity for liquids based upon the reaction rate theory. Hydrodynamicists have not been able to devise experiments to measure this coefficient with great accuracy or to determine its variation with temperature and pressure. Since this knowledge is required for many flow problems, (*e.g.*, propulsion of underwater missiles near the speed of sound), a study of this type seems justified.

The liquid is assumed to be composed of molecules with holes between them, across which a molecule may move from an activated to a

non-activated state. Using statistical mechanics and Eyring's reaction rate theory, the expression for the second coefficient is derived.

A simplification of this expression is made when the pressure is very large or very low. The final results show that the second and the ordinary coefficients of viscosity follow the same law of temperature variation.

3. The Determination of Base Pressure from Firing Range Data.

W. R. Witt; *U. S. Naval Ordnance Laboratory, White Oak, Silver Spring, Maryland.*

The ballisticians have for some time been concerned with under pressure at the blunt or flat base of missiles and projectiles. The major purpose of this paper is to present the importance and status of the base-pressure problem, and how it is investigated using the Pressurized Ballistics Range at the Naval Ordnance Laboratory.

The base drag caused by the base pressure is relatively small with respect to the total drag when the aerodynamic shape of the body is plump and its nose is blunt. It is, however, of the same order of magnitude as wave and friction drag when the bodies are sharp-pointed and slender. Long-range projectiles and missiles must have these latter features. In spite of the favorable shape the total drag of large guided missiles can amount to several thousand pounds of which the contribution of the base drag is then of the order of one or two thousand pounds!

The base pressure can be computed indirectly from the firing range data, provided that a projectile having a suitable shape is selected. The most common shape used is the so-called "cone-cylinder" projectile. The pressure acting on the head can be computed from compressible flow theory; the skin friction can be estimated; the total drag force is determined from the retardation measured in the firing range. Hence, the base pressure is obtained by subtracting the head and skin friction components from the total drag.

4. Large Elastic Deformation of Cantilevers with Hydrodynamic Loading.

P. Eisenberg and L. F. Whicker; *David Taylor Model Basin, Navy Department.*

Much work has been done on the shape and tension of flexible members (bending neglected) loaded by the forces arising during motion in a fluid. In this paper, computations are extended to the case of elastic members, and results are derived for the shape, bending moments, and shear of a uniform cantilever.

The loading is made up of the weight of the bar and the hydrodynamic force. The latter is assumed to follow the "sine-squared law," *i. e.*, unit loading is $R \sin^2\phi$ where R is the drag per unit length of beam when normal to the direction of motion and ϕ is the angle between the tangent to the bar and the direction of motion. Assuming the applicability of the Bernoulli-Euler law, assuming linear Hooke's law and no change in total length of beam, neglecting warping of the sections, and neglecting the tangential forces, the slope of the beam as a function of the distance along the beam is derived in the form of a nonlinear integro-differential equation. An approximate solution is obtained by expansion

in a McClaurin's series in which the coefficient of the first ten terms are evaluated.

Values of total shear are compared with experimental results for the drag of cantilevers with circular sections obtained from towing tests. The theoretical and experimental results are shown to be in good agreement for those cases in which available drag coefficients apply, *i. e.*, for nonvibrating beams, and for which the slopes at the free ends were as high as 63°.

5. Measures of Unsteadiness, Part I.

V. G. Szebehely; *David Taylor Model Basin, Navy Department.*

In this paper three measures of unsteadiness are proposed and quantitative evaluations of special unsteady fluid motions are performed.

The dimensionless value to compare oscillation tests is the Strouhal number (or "dimensionless frequency") which is generalized for arbitrary unsteady motions. The Strouhal-scalar, representing the ratio of the magnitudes of the local and convective acceleration vectors; the Strouhal-vector, in the direction of the local acceleration; and finally the Strouhal matrix giving a complete description of the unsteadiness are defined and analyzed. Steady flows are associated with zero values of the above measures. The measures are computed for ideal, viscous, incompressible, and compressible fluids and for several important flow problems, such as Beltrami flow, potential flow, d'Alembert flow, isochoric flow, slow motion, pseudo plane flow, pseudo rotational symmetric flow, lienarized flow, *etc.* The decay of vorticity in a viscous fluid, the inertia method of measuring ship resistance, and the problem of an unsteady jet striking a plate are discussed in details.

6. A Working Model Wind Tunnel.

Gerald D. Walberg; *Norview High School.*

Show and explain the evolution of the wind tunnel. Lift and drag tests, demonstration of stream lines over airfoils, use o fanaerometers, calculations of velocity are explained. The tunnel is 100 cm. long, 40 cm. wide, 20 cm. high, and its highest wind velocity is 23 miles per hour.

7. The Theoretical Behavior of a Complex Inelastic Material.

D. Frederick and M. A. Garcia; *Virginia Polytechnic Institute.*

The purpose of this study is to investigate the behavior of an inelastic material and to compare the results obtained with the properties of the well known material models investigated by Maxwell, Kelvin, and Zener. The most complex of the models mentioned above (Zener model) does not exhibit a permanent set and secondary creep. The importance of this paper arises from the fact that the model studied in detail herein does exhibit a permanent set and secondary creep in addition to all of the other common properties and behaviors.

The differential equation governing the behavior of the inelastic material is derived from a mechanism, composed of elastic and viscous elements, used to represent the action of the material. The solutions of

this equation with the proper boundary conditions yield all the laws of behavior.

Equations are obtained and curves are plotted for the following items: stress versus time, stress versus strain, Bauschinger effect, hysteresis, energy loss in a strain cycle, strain hardening, stress relaxation, primary and secondary creep, permanent set, and memory effect.

With such equations, the behavior of many materials (textiles, high polymers, metals) may be summarized and represented. Predictions regarding other actions may be made also.

8. A New Pressure Coefficient Equation for Two-Dimensional Supersonic Flow.

Robert Wesley Truitt; *Virginia Polytechnic Institute.*

This paper derives a new equation for the pressure coefficient for two-dimensional supersonic flows. The derivation results in an explicit equation for the pressure distribution over thin, sharp, two-dimensional supersonic airfoils and allows solution at free stream Mach number of unity in the expanding flow region. The analysis is based on the discovery that the shock and expansion angle can be closely approximated by an angle which is a function of the local Mach number after the disturbance. The paper shows that the magnitude of the local pressure coefficient is governed predominantly by the local Mach number. The present method of calculating the pressure coefficient eliminates the use of two shock-expansion graphs required in the Exact theory, and consequently is a very rapid and accurate method for finding the pressure distribution. In the analysis it is assumed that the shock waves exist and are attached to the body. As in the Ackeret theory the sign of the angle of the flow deviation serves to differentiate between shock and expansion flow. The form of the equation has almost the simplicity of the Ackeret equation and gives excellent agreement with the Shock-Expansion Theory. With the use of this new simple equation for supersonic flow and a recently derived equation for subsonic compressible flow, the solution for the pressure distribution over a flat plate airfold at free stream Mach number of one is found.

9. Utilization of Virginia Resources for Light Weight Aggregates.

R. M. Biggam and Frank C. Vilbrandt; *Virginia Polytechnic Institute.*

Although Virginia does not have available any deposits of vermiculite it has deposits of somewhat similar materials, which under the right processing, should produce an expanded product which could be utilized for insulation, light weight aggregates for concrete construction, for plaster, for poultry litter, and for florists' cultural purposes. This investigation was carried out on micas located near Amelia Court House, and several methods of heating, rates of heating, the inclusion of penetrating aqueous and non-aqueous liquids to assist in the rupture and expansion are described.

10. An Analytical Approximation Relating Internal Damping and Strain Amplitude.

E. Q. Smith and S. M. Gay, Jr.; *Virginia Polytechnic Institute,* and *David Taylor Model Basin, Carderock, Maryland.*

The influence of internal damping has previously been treated as an equivalent "viscous" damping. In the present paper the damping is assumed to be proportional to the n^{th} power of the strain amplitude. The resulting equation is solved by an approximate method and expressions for the logarithmic decrement and specific damping are derived.

The resulting expression is found to be in good agreement with experiment in the lower range of strain amplitudes for those materials which most nearly satisfy the restrictions imposed by the underlying assumptions. It is concluded that the proposed damping term is justified as a "first approximation."

11. The Influence of Degree of Crystallinity on the Thermal Conductivity of Nylon 66.

R. H. Snow and R. A. Fisher; *Virginia Polytechnic Institute.*

An investigation of the effect of degree of crystallinity on the thermal conductivity of Nylon 66 was carried on in the Department of Chemical Engineering at Virginia Polytechnic Institute during 1950 to 1952. The reason for undertaking this work was to determine whether nylon could be made more suitable for use as a bearing material, since low thermal conductivity is a major shortcoming of nylon for this use.

Studies were made on methods of increasing the amount of crystalline phase present in samples of nylon. It was found that by cold-rolling a slab to half its thickness and then annealing two hours at 450 degrees Fahrenheit the degree of crystallinity of commercial nylon FM10001 could be increased from 20 per cent to 30 per cent. The degree of crystallinity was measured by a density determination, and verified qualitatively by x-ray diffraction. Nylon FM10001 was identified as Nylon 66 by x-ray diffraction.

The thermal conductivity of the original and treated samples was measured according to American Society for Testing Materials method C177-45. Measurements were made at mean temperatures of 70 to 150 degrees Fahrenheit to show the increase in conductivity obtained by the treatment used and to show that the effect of temperature on the conductivity is that which would be expected from an aggregate of crystalline and amorphous phases.

12. Measurement of Fused Salt Enthalpies with a Copper-Block Calorimeter.

L. B. Johnson, Jr., and O. L. Updike, Jr.; *University of Virginia.*

Equipment has been constructed for the determination of enthalpies of materials from room temperature to 750° C or above. The sample is suspended in the center of a vertical tube furnace until it reaches constant temperature, then dropped into the cavity of a vacuum-jacketed

copper calorimeter block. The temperature rise of the block, determined with a thermopile or a resistance thermometer, then provides a measure of the enthalpy of the heated sample. Construction of the calorimeter and its instrumentation are described, along with the features of furnace design necessary to obtain a long isothermal region. Calibration data and results of enthalpy measurements for various fused salt mixtures are presented.

13. The Application of Electrical Analogs to a Study of Pulsations in Piping Systems.

Frank S. Fountain and O. L. Updike, Jr.; *University of Virginia.*

In a piping system containing gases, mathematical analogies can be found between pressure, flow rate, resistance (friction), and capacity, and the corresponding electrical parameters of voltage, current, resistance, and capacitance. Such electrical analogies offer an approach to the analysis of either transient events or periodic steady-state phenomena. To investigate this approach, equipment has been set up to generate gas pressure pulsations, and by a strain-gage device, to measure them and record their waveforms. Propagation and attenuation of these pulsations in piping systems is being studied by mathematical analysis and by direct comparison with their electrical counterparts.

14. The Correlation of Mass Transfer Coefficients with the Physical Properties of Extraction Systems.

A. E. Skrzec and Nelson F. Murphy; *Virginia Polytechnic Institute.*

An investigation has been carried out to obtain data on the transfer of mass between liquid-liquid systems, which will be of value for design purposes and which will contribute to a better understanding of the mechanism of transfer for the case of liquid-liquid extraction. The effects on the individual mass transfer coefficients, k_w and k_s, of both phase rates have been studied employing a 1-½ inch diameter, horizontal tube.

Five different solvents, partially miscible with water, were varied in phase rate flows from 1,000 to 15,000 lb-per hr.-per sq. ft. when the water rate was maintained constant at either 3,000, 7,000 or 9,000 lb. per hr. ft. Similarly the water rate flow was varied when the solvent rate was maintained constant, at the rates given above. The individual mass-transfer coefficients were correlated by six dimensionless groups according to the following equation:

$$\frac{K_s d}{D_w} = f\left(\frac{d\sigma}{\mu_s D_w}\right), \left(\frac{\mu_w}{\mu_s}\right), \left(\frac{\mu_s}{\rho_s D_w}\right), \left(\frac{\mu_w}{\rho_w D_w}\right), \left(\frac{dG_s}{\mu_s}\right), \left(\frac{dG_w}{\mu_w}\right)$$

Where:

k = individual mass-transfer coefficient
d = diameter of tube
D = diffusivity coefficient
σ = interfacial tension
μ = viscosity
ρ = density
G = mass rate of flow

Subscripts,

w = water
s = solvent

From this equation the coefficients ars shown to be functions of the phase velocity of both phases, the viscosities of each fluid and the diffusivity. The effects of the interfacial tension between the two liquid phases are reflected in these quantities.

15. Field Study of Concrete Curing Methods on Basis of Electrical Resistance.

Robert W. Czaban; *University of Virginia.*

In a paper presented to the Virginia Academy of Science last year, an electrical resistance method for the determination of moisture and temperature in hardened Portland cement concrete was described. Additional research conducted in a pilot study disclosed it would be possible to evaluate the curing of highway pavements *in situ*. Consequently, a large scale field investigation was undertaken in which five curing methods were rated on the basis of their efficiency in retaining moisture and controlling temperature variations. The methods compared were as follows: waterproofed paper, damp burlap, liquid membrane seal, liquid membrane seal covered with limewash, and no cure. Each was applied to a complete slab and repeated twice in both ordinary and air-entrained concrete. Immediately after application of a treatment, readings were started and made frequently during a 72-hour curing period.

The findings of this field study indicated that initial moisture loss in the upper part of a pavement was affected, to a large degree, by the curing treatment employed. In general, waterproofed paper and damp burlap were best able to control moisture retention. The tone of the surface appeared to be of primary importance in controlling temperature with light surfaces (such as limewash treated seal) resulting in the lowest and most uniform temperature through the slabs. Climatic conditions (*i. e.*, air temperatures, relative humidity, and rainfall) were reflected in the measurements taken, especially near the surface of the slabs.

16. VPI Chemical Engineering Research and Development Program.

Dudley Thompson and Frank C. Vilbrandt; *Virginia Polytechnic Institute.*

The program of chemical engineering research and development at the Virginia Polytechnic Institute may be classified under four headings: (1) unit operations, (2) unit processes, (3) industrial wastes, and (4) special projects. This program is reviewed employing color slides of selected representative projects as a means of focusing attention on the principal aspects of the program. Specific projects reviewed include: heat transfer, hydrogenation, molecular distillation, extraction, preparation of DDT, treatment of industrial wastes, effect of ultrasonics on liquid systems, and electrodeposition of aluminum.

BUSINESS SESSION

Two business sessions were held by the Section. The first was at 4:00 p. m., May 16, and consisted of reports by Dr. N. F. Murphy as

Section Editor. He reported that during the year only one paper had been published in the Journal which had been submitted through the Section Editor. More papers are desired. He also asked for cooperation in securing more advertising for the Journal. The section editors have voted to recognize academic Ph.D. degrees by titles in the Journal news items. The nominating committee, consisting of B. A. Niemeier, S. M. Gay and N. F. Murphy reported, and the following officers were elected without opposition:

Chairman — V. G. Szebehely
Secretary — R. W. Truitt

Professor Truitt moved that the Scientists with the Navy Department be thanked for their cooperation in presenting papers of interest. Motion seconded and passed.

During the second business meeting, held at noon, May 17, a prize was established for the best work presented by members of the Junior Academy in the field of engineering. Mr. Niemeier accepted the Chairmanship of the "Junior Academy Engineering Award Committee." Niemeier, Murphy, Witt, Truitt, and Szebehely offered to take care of the expenses connected with the award which shall consist of a scroll and a sum of $25. The Chairman of this committee was instructed to contact the Chairman of the Junior Academy and make all necessary arrangements for the 1952 Annual Meeting in connection with the above mentioned award.

Minutes of the Section of Geology [8]

WILLIAM H. BROWN, *Chairman*

RAYMOND S. EDMUNDSON, *Vice-Chairman*

WILLIAM T. PARROTT, *Secretary*

BYRON N. COOPER, *Section Editor* (1953)

FRIDAY, MAY 16—9:00 A. M.—JOHN SMITH ROOM

1. **Soil Conditions in the Norfolk County Virginia Area of the Great Dismal Swamp.**

Elvin F. Henry and Hobart C. Porter; *Virginia Agricultural Experimental Station, Soil Conservation Service.*

The Dismal Swamp is a large level to almost level tract of land lying within the lower Coastal Plain of Virginia and North Carolina. Its total area comprises about 400 square miles of which about 140 square miles are in Virginia, being parts of Norfolk and Nansemond counties. All of the swamp in Virginia is included in the regional physiographic area known as the Flatwoods. The elevation ranges from sea level to about 20 feet. All of the swamp lands have been classified with the Princess Anne and Dismal Swamp terraces which range in elevation from sea level to 25 feet.

The Norfolk county area of the Dismal Swamp has a very complex pattern of soil and peat conditions. These soils are generally classified as Bogs, consisting principally of mucky peat and mucky or peaty materials mixed with mineral soil. In many places the peat or mixed soil is topped with a reddish brown finely divided ashy material, the residue of peat burning. The depth of the peat layers varies considerably from place to place ranging from about 10 feet or more in the Lake Drummond area to only a few inches in areas nearer the outer periphery. The mineral soil textures range from loose open sands to sticky clays. Many of the soils are gray to dark gray in the surface and mottled gray and yellowish brown in the subsoil. A semi-detailed soil map of the swamp area indicated a fairly large area of mucky peat surrounding Lake Drummond and extending outward from the lake in an irregular pattern. Some large areas of relatively shallow mucky peat over sands and clays have been mapped near the center of the swamp indicating the uneven nature of the peat burning.

Lake Drummond, the largest fresh water lake in Virginia lies almost entirely within Norfolk county. Its total area is about 2500 acres and it occurs on a higher elevation than most of the surrounding swamp lands. This lake receives water from surrounding areas and possible underground sources. It serves as a feeder source for the Dismal Swamp Canal.

The swamp vegetation is varied. Tree growth consists of swamp and sweet gum, red maple, cypress, loblolly and pond pine, and scattered areas of white cedar. Shrubs and grasses include myrtle, bayberry, gallberry, smilax, blackberry, reeds, marsh grass, and sphagnum moss.

2. First Discovery of a Long In-Line or Coaxial Arrangement of Structures that Indicate Deep Crustal Penentration.

B. Ashton Keith; *The Institute of Sciences.*

Comparison of our voluminous field notes taken since 1909, with the authoritative reports of State and National Geologic Surveys definitely confirms our discoveries of four sets or systems of approximately parallel zones of mild crustal distortion that cross North America or large parts of it—making a giant grid, which divides the underlying igneous rocks into great blocks, mostly of quadrangular or triangular shape.

Studies of divers records have indicated that practically all these crustal blocks continually are affected by very great stresses that cause, or tend to cause very slow movements toward the equator and slightly toward the west. Microscopic studies on rocks taken from many places within these zones, have revealed minute distortions that must have been caused by microseismic movements (not "micro-seisms"); and the earthquake records show that very many crustal blocks are affected by seismic disturbances with comparative frequency. And too, they indicate that "earthquake movement" and "earthquake sounds" within the earth generally lead in that direction in the zone that is nearer the equatorial bulge of the earth, but seldom or never toward the North Pole.

This paper sets forth the circumstances that led to discovery of the first segment of a long east-west series of crustal penetrations and crustal movements, some results of later studies westward to San Francisco Bay, and eastward across Kansas, Missouri, Illinois and Kentucky. Extrapolation of that trend farther east leads through the earthquake area near Wytheville, below Newport News to the mouth of Chesapeake Bay.

3. Geologic Material Surveys as Highway Construction Aids.

John P. Meador; *Virginia Department of Highways.*

Due to an increase in highway construction, the need for finding all available local material which can be used on the job is absolutely necessary. The location of such materials is reflected in lower costs in bidding and shorter time to complete the project.

The Virginia Department of Highways has 95 percent of the State mapped for local materials such as stone, sand, sand and gravel, and gravel. These deposits are first correlated on a geologic county map, located by latitude and longitude, property owner, and quantities estimated. The conventional tests are run on these samples submitted and attached to the sample sheet. These are filed and a complete report is then written district by district. It is estimated that savings to both contractor and the State will be effected by such an inventory.

4. Current Projects and Present Status of The State Geological Survey[1].

William M. McGill; *Virginia Geological Survey.*

This paper consists of a report on various projects and activities of the State Geological Survey for the years 1951 and 1952 (to date), pro-

1. Presentation and publication approved by the State Geologist of Virginia.

posed projects for the 1952-1953 fiscal year, and the current status of the Survey in personnel and facilities. Discussed are (1) recent and current project assignments of the present 6-man technical staff; (2) summer seasonal projects; (3) recent and proposed cooperative projects with the U. S. Geological Survey; (4) topographic mapping in Virginia; (5) recent and projected publications; (6) additional or special cooperative ground-water investigations; and (7) planned new facilities, and authorized, needed additions to the technical staff.

5. An Occurrence of Fresh-Water Triassic Limestone in Culpeper County, Virginia.

R. S. Young and R. S. Edmundson; *University of Virginia.*

The limestone bed, ranging from 6 to 9 inches in thickness, occurs in the Manassas (Triassic) sandstone and is exposed in a quarry along State Route 3 about 3½ miles east of Culpeper. It has an oolitic texture and an uneven fabric. Minor structures include diastems and microfaults.

Calcite comprises about 87 per cent of the rock. Specialists in x-ray and differential thermal analyses identified ohlorite, quartz, and small amounts of talc in the light fraction of the insoluble residue and illite in the clay-sized material. Of the eight minerals recognized by petrographic study of the heavy mineral fraction, zircon and pyrite are abundant, rutile and tourmaline are scarce, and ilmenite, hematite, garnet, and corundum are rare.

A possible origin is suggested as follows: (1) wind rolls of small pellets of clay into lacustrine carbonate rich waters; (2) deposition of calcite around the nuclei; (3) lowering of wave-base and the breakdown into fragments containing ollites; (4) raising of wave-base and the simultaneous deposition of clay, oolites, and fragments containing oolites; (5) differential compaction causing minor folding and faulting; (6) deepening of basin and deposition of overlying red sandstone; and, (7) deposition of secondary quartz in pore spaces and growth of pyrite crystals.

6. Observations on the Basement Complex of the Atlantic Coastal Plain.

Wilbur A. Nelson; *University of Virginia.*

Over 100 deep wells have been drilled from Maryland to Florida since 1938, most of them in the Coastal Plain region of Florida, Georgia, and Alabama, which permit the making of an excellent 1000 ft. contour map of this area. The prominent topographic feature is a low dome known as the "Ocala Dome," located in northern Florida, and a distinct topographic ridge extending southward under the axis of the present Florida peninsula. The structural geology of the basement complex of the Georgia-Florida region does not coincide with the topography of the basement complex. The author's interpretation of the geologic structure of the basement complex is the occurrence of an east-west synclinal fold along the Florida-Georgia line, composed of Silurian and Ordovician rocks and bounded to the north and south by an east-west belt of rhyolites, tuffs, and agglomerates which are classified as Ordovician

in age. These volcanics in turn rest to the north and south on a pre-Cambrian complex which makes up the basement complex. Further south, the basement complex of Florida is composed of Jurassic rocks. From Georgia northward to Maryland, the topography of the basement complex shows a great trough or valley, extending along the southeast and northwest line, through Cape Hatteras, while along the North Carolina—South Carolina line is a distinct topographical ridge. Another topographic trough or valley occurs on a north-west, south-east line just a few miles north of Waycross, Georgia. Whether these two troughs and the one ridge coincide with the structure of the geology of the basement complex north of Florida, is not known.

7. Mineralogical Studies of Sediments of the Pamunkey River.

R. L. Figgers, F. T. McClintock and A. P. Neff; *Washington and Lee University.*

A study of sands collected along the Pamunkey River, beginning on the South Anna River, its southern branch, near Gordonsville, Orange County, Virginia, and continuing downstream to Yorktown, York County, Virginia, shows seven correlations between the heavy minerals of the sediment and the formations of the drainage area. With the exception of the increase in staurolite after the stream had received sediment from the St. Mary's formation in the Coastal Plain, all the correlations were with Pre-Cambrian formations of the Piedmont.

8. Mineralogical Studies of the Sediments of the Rappahannock River.

J. L. Bowles, W. H. Foster, Jr. and W. L. Osborne; *Washington and Lee University.*

Representative samples of the stream sediments of the Rappahannock River and its drainage basin were collected at such points as to represent the contributions of all the geologic formations traversed by the streams of the drainage area in an effort to correlate the sediments and their parent formations. Standard laboratory procedure was used to process these samples, and slides were made of the heavy minerals. The minerals found in this area were Magnetite and Ilmenite, Amphibole and Pyroxene, Muscovite, Zircon, Epidote, Rutile, Hypersthene, Tourmaline, Garnet, Staurolite, Sillimanite, Kyanite, Biotite, and Andalusite. Three distinct correlations could be made; (1) Near the headwaters in the northwest area of granites, gneisses and greenstones Epidote could be traced to the Catoctin Greenstone and Hypersthene to the Hypersthene Granodiorite. (2) In the central part of the area Staurolite could be traced to the Wissahickon Schist. (3) In the eastern part of the area Kyanite and Sillimanite occur for the first time so it is assumed that the Tertiary deposits in this area must be responsible for them.

9. Heavy Mineral Studies of the Sediments of the Appomattox River, Virginia.

R. J. Maccubbin, D. R. Moreland, R. E. Schaub, P. D. Weill; *Washington and Lee University.*

Samples of sediments were collected from the Appomattox River and its drainage basin in the middle Piedmont of Virginia. The usual

laboratory procedure for heavy mineral separation in the study of sediments was used. Slides were made of the heavy mineral separates and examined for possible correlations between the sediments and formations over which the Appomattox River passed. Heavy minerals found in this study were tourmaline, epidote, amphibole-pyroxene, staurolite, rutile, magnetite-ilmenite, muscovite, kyanite, zircon, garnet, sillimanite, biotite, chlorite, and titanite. There were four correlations made. The Wissahickon formation is a possible source of staurolite, muscovite, and kyanite. The Greenstone volcanic outcrops in the area of Appomattox, Virginia is a possible source of epidote, as well as a diabase dyke located eleven miles downstream from Farmville, Virginia. Other minerals found in the samples were either too abundant or too rare to be of use for correlation purposes.

10. Ground-Water Conditions on the Eastern Shore Peninsula, Virginia[2].

Allen Sinnott; *U. S. Geological Survey, Ground-water Branch, Charlottesville.*

The surficial rocks of the Eastern Shore are largely sands and gravels of Pleistocene age having a maximum thickness of 75 feet. These are underlain by about 900 feet of shell marl, sands, and clays of Miocene age, which in turn are underlain by glauconitic sands of Eocene age and sands, clays, and gravels of Cretaceous age. The Pre-Miocene sediments may reach a total thickness of 2,000 feet.

The Pleistocene rocks yield small quantities of water to thousands of shallow wells, and supplies of as much as 140,000 gallons per day are obtained by pumping several wells as a unit. Most of the large municipal and industrial supplies are obtained from aquifers of Miocene age, a few single wells yielding more than 600,000 gallons per day. The aquifers of Eocene and Cretaceous age in the southern part of the peninsula may yield water containing undersirable amounts of chloride.

Determination of the percentage of sodium among the cations in representative ground-water samples indicates that most of the water from the aquifers of Pleistocene and Miocene age is suitable for irrigation.

In order to adjust the harvest time of crops to optimum marketing conditions, irrigation is becoming more widespread, and it is likely that in the near future the aquifers in some areas may be heavily pumped for short periods each summer.

11. The Structure and Stratigraphy of the Barringer and Ingles Mountain "Windows," Montgomery County, Virginia.

Charles J. Gose, Jr.; *Virginia Polytechnic Institute.*

The Barringer and Ingles Mountain area, in west central Montgomery County, contains sedimentary rocks in age from Lower Cambrian to Upper Devonian. Also present are two post-Devonian formations, one

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2. Publication approved by the Director, U. S. Geological Survey, and the State Geologist of Virginia.

formed as the result of deformation which affected the area, the other an alluvial cover dotting the remnants of the Harrisburg surface above New River.

The initial stage in the deformational history of the area was the advance of an overthrust segment. This was followed by folding and high-angle thrust faulting. The folding of the autochthonous block below the overthrust sheet resulted mainly in a synclinal structure of the inliers which are exhumed portions of the autochthonous block, their uplift having been accomplished by the high-angle thrust faulting. The inliers, therefore, are not true windows inasmuch as they are not surrounded by the same fault trace but are bounded on the northwest by a high-angle fault system that cuts both the overthrust sheet and the overridden blocks of the Pulaski fault.

12. Chert Crystals from the Knox Dolomite.

Richard V. Dietrich; *Virginia Polytechnic Institute.*

Chert has been found to occur in the form of imperfect hexagonal prisms (ranging from 3 inches to 10 inches across) near the top of the Knox dolomite along Indian Run, 2½ miles east of Blacksburg, Virginia.

Physical properties, including optical and x-ray data, and the chemical composition of the chert have been determined. Petrographic examination shows that the chert is comprised of small grains of quartz, micro-pore spaces, and minor impurities in a matrix of opal and chalcedony.

The single chert crystals may be mainfestations of a preferred orientation of the numerous small individuals of quartz.

13. Foreset Bedding in the Clinch—Tuscarora Sandstone of Virginia.

W. D. Lowry; *Virginia Polytechnic Institute.*

Foreset bedding with an original dip of as much as 20 degrees occurs in the Clinch-Tuscarora sandstone at a number of localities in the Valley and Ridge Province of western Virginia. In western belts, the original dip of the foresets was predominantly to the northwest. In middle and eastern belts, the original dip of the foreset beds was mainly to the northwest. Although original dips of the foresets to the southwest, west, north, and even north-northeast in the easternmost belt have been noted; no original dips to the east or southeast have been found. Only in the Massanutten Mountain area where the Silurian sandstones have not been differentiated is there a tendency toward compound foreset bedding.

The predominant northwesterly original dip of the foresets indicates that the water which deposited the Clinch-Tuscarora sands was moving to the northwest and that their source lay to the southeast. Supporting evidence is found in:

1. Decrease in the size of the chief ingredient of the sands from southeast to northwest.
2. Decrease in percentage of coarse sand and pebbles to the northwest
3. Decrease in rounding to the northwest.
4. Apparent decrease in total thickness to the northwest and a decrease in thickness of individual beds.

5. An increase in the aggregate thickness of the lower Silurian sandstone section to the southeast where the Clinch-Tuscarora has not been separated such as in the Massanutten Mountain area.

6. The presence of swash marks in the Clinch-Tuscarora sandstone which indicates that the waves broke on a shore to the southeast.

Geology, Soil Mechanics, and Botany.

Stephen Taber; *University of South Carolina.*

The youthful science, soil mechanics, properly belongs with the other earth sciences in the geology family, for it deals with the physical properties of the surficial mantle of the earth and the exploration of geological phenomena, but the geologists have neglected this science, and it has been kidnapped by the engineers. World War II has emphasized the importance of soil mechanics, frost heaving, and related problems. Many organizations including the Navy, Army, and United States Geological Survey have sponsored much research in this field, but many enthusiastic young scientists have been handicapped by lack of training in soil mechanics.

The mechanics of frost heaving in the tundra of Alaska are largely confined to upward expansion of the ice crystals in the silt as the layers of vegetation insulate the sides of the soil so no appreciable lateral movement takes place.

Geological students planning to study problems involving frost action are urged to take a well designed laboratory course in soil mechanics so that many geological phenomena which are attributed to horizontal thrusting or expansion in volume would be explained in terms of soil mechanics. They might better appreciate the value of experimental as well as observational evidence in the solution of geological problems.

14. A Bryozoan Fauna from the Tyrone Formation Near Hagan, Lee County, Virginia.

Mary H. Ross and Wayne E. Moore; *Virginia Polytechnic Institute.* (Presented by Mary H. Ross).

The fauna described in this paper was obtained from a sequence of impure limestones, limestones, greenish mudstones, and bentonites that are exposed in a cut along the Louisville and Nashville Railroad near Hagan, Lee County, Virginia. These beds have been referred in the past to the Eggleston formation and correlated with the Tyrone or "Birdseye" limestone of Kentucky.

The Tyrone was first considered to be of Chazyan age, but was correlated by Foerste in 1913 with the Black River. In 1941 Schuchert and Dunbar placed the Tyrone in the lower Trenton. Huffman in 1945 advanced stratigraphic reasons for the Trenton age of the Eggleston in Virginia and the Tyrone in Kentucky which he correlated with the Rockland-Kirkfield of the New York standard section. Since that time these beds have been regarded as equivalents of the Rockland. B. N. Cooper in 1950 called these beds Tyrone because he believed them not to be exact equivalents of the Eggleston.

This bryozoan fauna is being described for two reasons: to assemble further evidence for an accurate age determination of the Tyrone in Lee

County, and to establish known bryozoan zones that are related to the more modern stratigraphic units in use today in the Virginia-Tennessee-Kentucky area.

This fauna is characterized by the genera *Batostoma Homotrypa, Callopora, Monticulipora, Prasopora, Atactoporella, Escharopora, Rhinidictya, Helopora,* and a few genera that have not been sectioned as yet. Preliminary study of the species suggests a lower Trenton age.

15. Preliminary Report on the Occurrence of Ordovician Foraminifera Near Catawba, Virginia.

Wayne E. Moore; *Virginia Polytechnic Institute.*

Records of pre-Mississippian Foraminifera are rare in geological literature. Approximately one dozen papers report the only occurrences. Most early Paleozoic foraminiferal faunas have been reported from the Silurian and Devonian in North America and in Europe. Ordovician Foraminifera have been reported by Moreman from the limestones of Oklahoma and questionable remains are reported by Yabe and Hanzawa from the Ordovician of Manchuria.

This fauna was obtained from limestones exposed near the base of Catawba mountain near Catawba, Virginia, along Highway 311. The limestone is of middle Trenton age. The arenaceous Foraminifera were freed from the matrix by dissolving the limestone in dilute acid. The insoluble residue was then carefully washed free of mud, and the residue examined for Foraminifera.

One unquestioned species of Foraminifera has been recovered from the residue. At least two questionable species that may be referred to the Foraminifera have been recovered. The problems of identifying early Paleozoic Foraminifera will be discussed, and some suggested methods of study will be proposed.

16. Vertical Stylolites.

B. N. Cooper; *Virginia Polytechnic Institute.*

Examination of about 2,500 feet of cores from the Mississippian limestone formations just north of Horton Summit, Scott County, Virginia, has afforded the writer an excellent opportunity to determine the probable origin of stylolites so abundantly developed in these strata. The beds involved are so nearly horizontal that the vertical "sutures" noted at several stratigraphic levels in the Mississippian limestone cannot be explained as "tilted stylolites." Many are sufficiently perpendicular to bedding to be traceable in vertical cores for distances of up to 2½ feet. The vertical stylolites have the same features as those that are parallel or subparallel to bedding. The probable origin of the stylolites, both horizontal and vertical, is considered to be somewhat different than would be possible under the "pressure-solution" hypothesis as generally conceived.

17. Headward Growth of Anticlinal Valleys by the Karst Cycle of Erosion.

Charles F. Lane; *Longwood College.*

Much has been written about cycles of erosion in karst regions and about the evolution of the present topography in the folded Appalachians. The literature on the erosion of the folded structures has been concerned mostly with the development of surface drainage and the evolution of topography by the fluvial cycle of erosion.

While working on a physiographic field problem in the Cumberland Plateau of Tennessee, the author was impressed by the importance of solution and subterranean streams in the headward growth of Sequatchie valley. This valley has been eroded along the axis of an anticline which extends for nearly 200 miles from Cumberland County, Tennessee, southwestward into Alabama.

A study of six coves in this area reveals that the surface features have been developed by two types of erosion cycles. The initial stages in the evolution of the topography resulted from the fluvial cycle of erosion on folded strata, while the later stages were the result of the karst cycle of erosion. It may be assumed that the same processes that are so active today were active in forming the entire Sequatchie valley and many of the anticlinal valleys in the Ridge and Valley Province.

18. The Geologist as His Own Press Agent.

W. T. Parrott; *Virginia Department of Highways.*

In spite of the advance of geology into fields of modern endeavor, the popular conception of a geologist is a doddering individual who thinks in astronomical time units and speaks in an unintelligible tongue. It is realized that for academic work the geologist must use technical terms but he has not done a great deal to translate his ideas and findings into terms which can be understood by the general public.

The geologist should do all he can to encourage the study of geology in the high schools, among high school teachers, and to see that any new ideas or bulletins are used by the newspapers in a popular way in order for all people to benefit from the new advances in this science. The geologist as an individual or the profession as a whole does not desire public adoration or cheap publicity. Geologists should however demand to be recognized for their achievements either singly or in cooperation with other sciences.

19. The Role of Temperature in Pegmatite Formation.

Paul L. Weis; *University of Virginia.*

A study of fluid inclusions in minerals from zoned pegmatites was undertaken as a check on the theory of zoned development through fractional crystallization in a restricted system. Beryl, spodumene, and garnet gave results that showed general agreement; the most extensive results were obtained from beryl.

Temperature determinations were made by heating polished mineral sections under the microscope and recording the temperature of disappearance of the vapor phases of the fluid inclusions.

Beryl from inner zones of the Highland Lode and Bob Ingersoll No. 1 pegmatites yielded lower temperatures than beryl from outer zones. Results from the Peerless and Bob Ingersoll No. 2 pegmatites were inconclusive or contradictory. No other pegmatites gave enough data to allow establishment of any temperature trends.

Temperatures observed in beryl ranged from 216° to 515° C. Results from individual crystals showed a range of 9° to nearly 200° C., and individual zones gave ranges of 65° to 230° C.

Data were too meager to permit presentation of conclusions, but results give tentative support to the hypothesis of fractional crystallization. Estimates of pressures prevalent at the time of crystallization imply temperatures of crystallization in excess of 800° C. for early-forming beryl crystals.

20. Preliminary Notes on the Rockfish Conglomerate, Virginia.

Horace B. Cooke, Jr.; *University of Virginia.*

This paper reports on the detailed mapping and petrographic study of the Rockfish Conglomerate which was first reported by Prof. W. A. Nelson in 1932. It is an abstract itself of a thesis in candidacy for the degree of Master of Science.

The Rockfish Conglomerate is described and its limits are stated. It is further broken down into the two members Rockfish Conglomerate Restricted and Mt. Jefferson Sandstone. Each of these members is described in detail.

Three problems are recognized related to the Rockfish Conglomerate. These are the source of the material, the method of transportation and deposition, and the metamorphism of the Rockfish sediments. Each of these three questions is discussed and probable answers postulated on the basis of field and laboratory study.

Minutes of the Section of Medical Sciences [9]

D. T. WATTS, *Chairman*

E. G. HUFF, *Secretary*

WILLIAM BICKERS, *Section Editor* (1953)

FRIDAY, MAY 16—9:00 A. M.—CHESAPEAKE ROOM

1. Variations in Heparin Metachromasy.

John W. Kelly; *Medical College of Virginia.*

Heparin and related acid mucopolysaccharides stain metachromatically with toluidine blue. Using this dye, heparin metachromasy may be studied by vital staining, by the staining of fixed sections, and *in vitro* using a spectrophotometer. The last method, in conjunction with model systems, provides information of value in interpreting the results of both staining methods. Basic proteins are known to form strong salts with acid mucopolysaccharides. This fact was utilized to produce "potentially metachromatic" systems by suppressing heparin metachromasy with protamine and histone. The effects of heat, ultraviolet irradiation, x-rays, and proteolytic enzymes upon these suppressed systems were then studied. The resulting spectrophotometric changes were usually related to change or destruction of the basic protein, the heparin being unaffected. X-rays, however, destroy both basic proteins and heparin. These results may be related, in part, to physiological and cytochemical observations.

2. Studies on the Persistence of Digitalis Effectiveness in Dogs.

Mark E. Holt, Jr. and Harvey B. Haag; *Medical College of Virginia.*

The potencies of the preparations were determined by slow intravenous injection of the diluted preparation into anesthetized dogs to cardiac standstill. Values were: digitoxin 0.63 mgms./kgm., digitalis 118 mgms./kgm. In intravenous studies, 50% value was given in one dose, and at various intervals dogs were "back titrated." Oral persistence studies were done only with digitoxin. These dogs were given from 20% to 70% of the intravenous unit daily. The clinical end point was nausea and vomiting for two successive days at which time the dogs were "back titrated." Base line electrocardiograms were taken before dosage and repeated immediately prior to and during "back titration." Anesthesia consisted of intravenous phenotbarbital. In dogs digitalis leaf manifests a greater persistence of activity than does digitoxin on intravenous administration. On oral administration consistent evidence of a cumulative effect occurred only when digitoxin was given in amounts corresponding to 50 % of the average intravenous fatal dose. "Back titration" at the time of vomiting showed significant persistence in dogs which were "back titrated" 15 minutes to 2 hours after vomiting on the day of dosage. Dogs

which vomited and were titrated 24 hours later showed *no* persistence by this method. Electrocardiograms, in instances, showed evidence of digitalis effect in dogs which individually showed no persistence by "back titration."

3. Toxicological Studies on the Zinc and Disodium Salts of Ethylene Bisdithiocarbamate (Dithanes Z 78 and D 14 R).

R. Blackwell Smith, Jr., J. K. Finnegan, P. F. Sahyoun, H. B. Haag; and P. S. Larson; *Medical College of Virginia.*

The acute oral LD_{50}'s in rats of the zinc and disodium salts of ethylene bisdithiocarbamate are >5200 mgm./kgm. and 395 ± 12 mgm./kgm. respectively. The zinc compound has less than one tenth the goitrogenic potency reported for the disodium salt. Dietary levels of 10,000 p.p.m. of the zinc salt are required to produce unequivocal microscopic pathology of the rat thyroid within 30 days, although an upward trend in gland weights appears at lower levels. This lesser goitrogenic potency is apparently due to the fact that only 11-17% of the zinc compound is absorbed from the gastrointestinal tract. Neither of the salts is a notable primary irritant to the skin of man. Individuals may be sensitized to skin contact with the disodium salt, but no evidence of sensitization was obtained with the zinc compound. The feeding to rats of dietary levels of zero, 500, 1000, 2500, 5000, and 10,000 p.p.m. of the zinc salt for a period of two years did not affect mortality in the male. In the female there was apparent increased mortality at the 5000 and 10,000 p.p.m. level. Adult dogs have been fed the zinc compound at dietary levels of 20, 2000 and 10,000 p.p.m. for one year without adverse effect on body weight. Dogs fed 10,000 p.p.m. showed a definitely increased thyroid weight to body weight ratio. Histopathologic studies are in progress.

4. Changes in the Adrenal Ascorbic Acid and Cholesterol Levels Following Acute Alcoholic Intoxication.

G. M. Duncan; *Medical College of Virginia.*

Acute intoxication produced by oral or intraperitoneal administration of alcohol resulted in depletion of the adrenal cholesterol and ascorbic acid levels in both intact white rats and guinea pigs, but not in hypophysectomized rats. It is recognized that the depletion which occurs in intact but not in hypophysectomized animals in response to various forms of stress stimuli may be taken as an indication of the activation and increased secretory level of the adrenal cortex induced by release of ACTH from the anterior pituitary. Guinea pigs were found to be considerably more susceptible to an oral dose of alcohol. For example, 5 gm./kgm. of body weight resulted in more severe and prolonged intoxication in the guinea pig than 7 gm./kgm. in the rat although the degree of reduction in adrenal cholesterol and ascorbic acid was approximately the same for both species. The reduction in both substances occurred much later in the guinea pig; almost no change being apparent in 9 hours, although at 24 hours both substances were greatly reduced. Maximum depletion was usually found in from 3 to 5 hours in the rat and restoration was underway by 9 hours. In the guinea pig the ascorbic acid showed no significant tendency to return to normal and the

cholesterol level rose very slowly unless ascorbic acid was administered in the diet or otherwise. The injection of 50 mgm. of sodium ascorbate jointly with the alcohol and at 24 hour intervals thereafter accelerated the return of the cholesterol and restored the ascorbic acid to the control level by the end of 72 hours. Intoxication and reduction in both adrenal substances occurred in the rat following the intraperitoneal injection of a dose of alcohol that would have produced almost no effect if taken orally. The guinea pig, however, required approximately the same amount intraperitoneally as orally in order to obtain comparable intoxication and reduction of these adrenal constituents.

5. Lipotropic Action of Vitamin B_{12}.

Forbes, J. C. and O. Petterson; *Medical College of Virginia.*

Studies on the lipotropic action of vitamin B_{12} in the white rat show that it possesses marked lipotropic activity when fed along with a low protein, 5% fat diet. When the diet contained 40% fat vitamin B_{12} alone exerted no lipotropic effect when fed at a level of 60 mg./kg. of diet, an amount which exerts a marked lipotropic effect when the diet contains only 5% fat. However, if the basal diet contains a moderate but inadequate amount of choline and inositol the further addition of vitamin B_{12} has been found to exert quite a marked lipotropic effect. It is thus apparent that the lipotropic requirement, even when the animals are on a high fat diet, can be at least partially fulfilled by vitamin B_{12}.

6. The Effects of Thyroxine on the Oxidation of Ascorbate and Succinate by the Cytochrome Oxidase System.

Chalmers L. Gemmill; *University of Virginia Medical School.*

Using fresh rat heart homogenates, it was observed that thyroxine inhibited the oxidation of ascorbate by the cytochrome oxidase system. The degree of inhibition was inversely proportional to the cytochrome /c/concentration. Thyroxine stimulated the oxidation of succinate in the rat heart homogenate-cytochrome c system but inhibited the oxidation of this substrate in the methylene blue-rat heart homogenate system. In order to explain these three findings, it is assumed that thyroxine forms a reversible oxidation-reduction system with its position between that of the ascorbate and cytochrome c system.

7. The Stimulation of Smooth Muscle by Adenosine Triphosphate.

D. T. Watts; *University of Virginia Medical School.*

These experiments have shown that adenosine triphosphate in concentration of 5 to 50 micrograms per milliliter will initiate a contraction in a rat uterus preparation which has been brought to quiescence by suspending it in low calcium Ringer's at 30°C. The response of different uteri shows a wide variation but in a single preparation under optimum conditions the contractions appear to be proportional to the log of the concentration of adenosine triphosphate. Adenosine monophosphate and phosphocreatine do not stimulate the preparation. Adenosine triphos-

phate stimulates the atropinized preparation which is no longer sensitive to acetylcholine.

8. The Mechanism of the Uptake of Radioactive Phosphate by Human, Rabbit, and Chicken Erythrocytes.

D. R. H. Gourley; *University of Virginia Medical School.*

Both human and rabbit erythrocytes take up labeled inorganic phosphate ions at a comparatively rapid rate while the nucleated erythrocytes of the chicken take up phosphate ions very slowly. For example, after incubation with P^{32} in *vitro* at 37°C for 2 hours the erythrocytes in typical samples of rabbit blood contain 50% of the added P^{32}, in human blood with a higher hematocrit the erythrocytes contain 60%, but in chicken blood even when the hematocrit is adjusted to about that of human blood the erythrocytes contain only 15% of the added P^{32}. The uptake of phosphate ions by human and rabbit erythrocytes is not affected by the absence of oxygen but the removal of oxygen from the environment of chicken blood inhibits the transfer of phosphate ions into these erythrocytes. In spite of this apparent difference, the experimental data are consistent with the hypothesis that phosphate enters the erythrocytes of each species investigated by the formation of ATP at the cell membrane.

9. The Mercuric Chloride Inhibition of Urease and Its Reversibility at Varied Urea Concentrations.

Henry E. Evert (introduced by C. L. Gemmill); *University of Virginia Medical School.*

The variation of SH groups during urease activity has been further investigated by the inhibition-reactivation method and results in agreement with those previously reported (Fed. Proc., 10: 1950, 246) have been obtained. In the present study, the mercuric chloride inhibition of urease was investigated with urea concentrations varied from 0.83-2.5 x 10^{-6} moles per 10 ml. in the reaction. The urea decomposed in 10 minutes was plotted against the mercuric chloride concentration. With the use of these curves, the concentration of mercuric chloride required for 50% inhibition was plotted as a function of ureolytic activity. Parabolic or bell-shaped curves were obtained that were similar in shape to those obtained by the colorimetric SH analysis. In addition, the reversibility of the inhibition by thiol compounds (BAL, Cysteine, GSH and TGA) was also determined. The data obtained from the reactivation experiments substantiated previous results. For example, a higher concentration of thiol compound was required for reactivation at 2.1 x 10^{-6} moles urea per 10 ml. than at 2.3 x 10^{-6} moles urea per 10 ml. Observations were interpreted to mean that the mercuric chloride inhibition is dependent upon the free SH variation and upon the urea concentration in the reaction. The SH variation and the urea concentration appear to be related to the formation of a urea-urease complex as was suggested by the results obtained by the colorimetric SH method.

10. The Influence of Histamine on the Oxygen Consumption of the Gastric Mucosa.

Leslie E. Edwards and Joyce P. Wills; *Medical College of Virginia.*

It has been shown by other investigators that active secretion increases the oxygen requirement of gastric secretory tissue. This investigation has been designed to make use of this information for future use in assaying stomach mucosa extracts. Therefore, the standardization of the procedure was studied. A layer of mucosa was stripped off the stomach. The tissue was placed in nutritive solution and the oxygen consumption was measured by the Warburg technique. The drugs used for standardization were the following: histamine, histamine and thiamine, and carbamylcholine. In spite of the fact that the normal frog can have a spontaneous in vitro acid secretion, the oxygen requirement remained constant for a four hour period. When histamine was introduced through the side arm, after a one hour control period, the oxygen consumption increased to a maximum of 46% above the normal, during the following four hours. Thiamine was used as an inhibitor to diamine oxydase. Thiamine and histamine increased the oxygen requirement above normal. Thiamine alone had little or no effect on the oxygen uptake. Carbamylcholine had very little effect on the oxygen uptake of the tissue.

11. Meningocele, Umbilical Hernia, Exstrophy of the Bladder, and Epispadias in a Newborn Infant.

James E. Kindred and James Odum; *University of Virginia.*

The present paper is a preliminary report of abnormal conditions which occurred in a one month premature infant which lived two days. There was extreme modification of the body caudal to the umbilicus. Ventrally there is a large umbilical hernia, caudal to which is an evulsed projection of the rectum in the median line surrounded laterally and caudally by the open mucosa of the bladder upon which the ureters open. The exstrophied bladder and urethra are met by a ridge of skin between the legs. The phallus is represented by two laterally lying, separate masses uncovered by skin (Extreme epispadias). The skin below them continues as the scrotum, with a definite raphe. Undescended testes lie at the edge of the bladder. An imperforate anus lies just caudal to the raphe. A large cutaneous meningocele extends dorsally from the anus and covers the sacro-lumbar region. The meningocele contained about 1000 cc. straw-colored fluid. Spina bifida and deficiency of the pelvic girdle and muscles are present. The open neural groove lies on the floor of the meningocele. The case is presented with reference to current theories of etiology of exstrophy of the bladder and epispadias.

12. Histological Studies of the Reduction of Tetrazolium Derivatives (TD) by Normal and Diseased Human Tissues.

Y. T. Hsu and Cornelia Hoch-Ligeti; *University of Virginia School of Medicine.*

The enzymatic reduction of the colorless, water-soluble triphenyltetrazolium chloride (TTC) to a red, water-insoluble formazan has been described to differ in malignant and normal tissues. Authors found, in turn, absent, decreased, or significantly increased activity in malignant tumors. These differences were considered useful for diagnostic purposes. To evaluate this possibility for human tissues the reduction of TTC and neotetrazolium in over a hundred operative specimens was investigated. TTC and neotetrazolium reacted always similarly. Normal connective tissue did not reduce TD. Reduced TD is soluble in fat droplets. Epithelial cells contained reductases, glandular epithelium being more active than squamous epithelium. Kidney and liver showed strong activity. In benign tumors, and in chronic inflammation, the participating tissues behaved like homologous normal tissue, *i.e.*, connective tissue was inactive, epithelium active. Epitheloid cells in tubercles reduced TD. Epithelial cells in all carcinomas showed reductive activity, sometimes weaker sometimes stronger than the surrounding normal epithelium or epithelium of benign tumors. Sarcomas and the stroma of carcinomas repeatedly but not always reduced TD and in that they differed from all adult connective tissues. From these results it seems unlikely that the reduction of TD in operative material could be used for diagnoses of malignancy.

13. A Histochemical Study of the Parotid Gland of the Toad.

Douglas E. Bragdon; *University of Virginia.*

—Paper was not read.—

14. Neurogenic Erythrocytosis.

G. R. Hennigar, E. C. Hoff, and J. F. Kell, Jr.; *Medical College of Virginia.*

Neurogenic erythrocytosis has been discussed in the literature under the heading of Neurogenic Polycythemia. The term polycythemia should be reserved for a neoplasm of the erythropoietic tissues of the body. It was characterized clinically many years ago by Vacquez and Osler, under the title of Polycythemia Rubra Vera. During a clinicopathological study of fifty cases of hemangioma (hemagioblastoma) of the cerebellum by Silver and Hennigar at the Johns Hopkins School of Medicine elevation of the red cell count was found in the peripheral blood in 15% of cases. Previously, Carpenter and Walker had reported two cases of erythrocytosis in hemangioma of the cerebellum. The pathogenesis of the erythrocytosis has remained a mystery. A histological study of the cases referred to above as well as an additional fifteen cases of hemangioma of the cerebellum, taken from the files of the Medical College of Virginia failed to show erythropoiesis occurring in the tumor. It was suggested then, that the term hemangioblastoma

coined by Cushing and Bailey be dropped. A variety of lesions within the cranium lead to erythrocytosis. Subdural hematoma chronica, basophile adenoma of the hypophysis, and lesions of the diencephalon are those most commonly implicated. Since neurological signs such as dizziness, headache, dimness of vision, are frequent in polycythemia rubra vera, it becomes obvious that intra-cranial lesions, especially neoplasia accompanied by erythrocytosis be considered in the diagnosis of any polycythemia or erythrocytosis. Using metrazol and electrical stimulation of the pre-motor cortex of the cat erythrocytosis has been produced almost uniformly in all animals. Hematocrit, hemoglobin and bone marrow studies have been utilized. As the study progresses we hope to show that prolonged stimulation (electrical) of the pre-motor cortex will "fire-off" the sympathetic nervous system, lead to vaso-constriction of the arterioles in the bone marrow. This vaso-constriction brings about a state of hypoxia with resultant compensatory erythrocytosis. It is hoped that direct stimulation of the diencephalon will lead to the same results in cats.

15. Preservation of Speech with Almost Complete Atrophy of the Major Hemisphere.

Walter Riese; *Medical College of Virginia.*

While transient aphasia may follow almost any lesion of the cerebral hemispheres, lasting speech disturbances result, as a rule, from lesions involving the so-called critical area of language, on the left hemisphere in right-handed and on the right hemisphere in the left-handed people. Regained or preserved speech is generally believed to be the result of substitution or "taking over" of function by the spared parts, more specifically, the symmetrical areas of the minor hemisphere. The case of a graduate nurse is reported who, at the age of 58, suffered a stroke which paralyzed her left side and left her speechless for a while. A few months later she suffered a second stroke. Following this second stroke she passed into a state of psychotic agitation which, however, improved. In the last years of her life her conduct was undisturbed. Though aphasic until her death, at the age of 71, she retained a considerable amount of spoken language with understanding preserved. She had difficulties in word finding and marked syntactical defects. There were recurrent utterances in her speech which was voluminous and always accompanied by vivid gestures. The patient was able to repeat, and she retained some reading and writing abilities. Her entire right hemisphere was found to be atrophic. The cerebral cortex was completely degenerated with no nerve cells remaining. Patient was originally left-handed, but taught to write with her right hand. Since her remaining speech was not the result of training or re-education, it was evidently due to the intrinsic activity of her right or minor hemisphere.

16. Studies in Protein Metabolism of Tumor Cells. A. S^{35} Methionine Uptake by HSI Ascites Tumor in Mice: Preliminary Report.

G. Z. Williams, J. E. Williams, with Technical Assistance from M. L. Haigler; *Medical College of Virginia.*

S^{35} methionine is readily utilized as a radioactive tracer for investigation of protein synthesis by living normal and cancer cells. The HSI

ascites tumor in mice approaches an ideal agent for such studies. Eighty-five to 95% of the cells are cancerous, no necrotic debris or stromal tissue is present to dilute the tumor and the cell population in uniform and free in fluid. Results may be computed per cell. S^{35} methionine incorporated in a balanced amino acid mixture was administered to mice by parenteral injection for 10 days before, and in a second experiment, for 4 days after intraperitoneal transfer of HSI tumor cells. Cells were removed at 5 days, counted, washed, and radioactivity determined. In a third experiment, the tumor cells and amino acid mixture were incubated 60 minutes in vitro, washed and radioactivity determined. Controls were run with formalin killed cells to determine absorption factor. The results indicated that: (a) Living HSI mouse cancer cells actively take up S^{35} methionine in vivo and in vitro apparently incorporating it in the cell proteins. (b) HSI cancer cells growing intraperitoneally derive S^{35} methionine from the host mouse which previously had incorporated the radioactive amino acid in its normal tissues. Studies are in progress to determine the cellular location and nature of the radioactive components produced by S^{35} methionine uptake.

17. Alterations in Decompression Tolerance Produced in Rats by Ethyl Alcohol and in Mice by Sodium 5,5 Di-Phenyl Hydantoinate (Dilantin Sodium).

E. H. Sharp, L. E. Rennie, and E. C. Hoff; *Medical College of Virginia.*

The survival time of young adult albino rats in a decompression chamber without supplementary oxygen at pressures of 180, 170, and 150 mm. Hg was determined in a group of animals receiving ethyl alcohol by stomach tube in dosages of 7 gms./kg. of body weight one hour before decompression. The tolerance of these animals was compared with that of control rats given water before the simulated flight. All animals were decompressed independently at a standard rate of 100 mm. Hg per minute. At 180 mm. Hg the average survival time for control rats was 2 hours, 19 minutes and for alcohol rats was 44 minutes, 32 seconds. At 170 mm. Hg the control rats showed an average survival time of 1 hour, 13 minutes, while the alcohol rats lived an average of 25 minutes, 47 seconds. At 150 mm. Hg the average control survival time was 24 minutes as contrasted with an average survival time of 8 minutes, 35 seconds for the alcohol rats. In white mice given sodium 5, 5 di-phenyl hydantoinate (Dilantin Sodium) intraperitoneally as a 1% physiological saline solution in 2 mgm. doses per animal, there was an increased survival time in all animals at 180, 170, and 150 mm. Hg as compared with controls given saline injections.

18. Linkage Studies of Sickling and M, N, and S. Blood Groups.

Marion Waller, R. D. Hughes, and R. K. Waller; *Medical College of Virginia.*

Analysis of data supplied by 55 Negro families comprising 325 kindred, failed to reveal linkage between the MNS blood group genes and the gene for sickling. These findings are not in accord with those of Snyder and coworkers. Thus an example of autosomal linkage, for

which Snyder *et al.* presented evidence, is now in doubt and warrants further investigation. Data ascertainable for linkage calculations between the blood group S and sickling, and MN and S were very small. Linkage between S and sickling could not be found. The blood groups MN and S afforded evidence for linkage thus fitting into the very considerable evidence on this point for Caucasians.

19. Some Observations On Squid Axons Structures; Use of an Intracellular Light Source.

S. Solomon; *Medical College of Virginia.*

To investigate axonal ultrastructure, a method is being developed to study light scattering properties of structural elements as a function of activity. A quartz rod is drawn into a microneedle and after impaling the axone (mounted on a microscope stage) along its long axis, serves as an intracellular light conduit and mechanical prod. Light emerging from the needle tip has been observed visually, or has been monitored by a photomultiplier tube leading to a microammeter. As might be expected of any colloidal system, emergent light is scattered in typical Tyndall fashion, with no resolvable granules visible at the magnification used. When, however, the needle tip is vigorously moved about in the axoplasm, there results a local increase in fluidity and resolvable granules appear, and this change is reversible but only during the early phases of an experiment. If the prod is gradually advanced, a series of alternate light and dark curved bands (concave toward the needle tip) forms in the axoplasm ahead of the microneedle tip. These bands are seen to be cross-sections through cup-shaped regions of different light scattering properties. Band size, curvature, and spacing have been measured but otherwise the geometry of the system has not been controlled. With the aid of a photomultiplier tube for measuring light intensities, changes in emergent light resulting from stimulation have been sought. In 13 nerves, 85 periods of stimulation (175/sec., 80-150 secs. duration) caused a decrease in emergent light in 61, no change in 23, and a small increase in 1. Precise time characteristics are not yet determinable. The average maximum decrease in emergent light is about 3.3%, occurring after about 100 sec. of stimulation. Supramaximal stimulation in nerves which have failed to conduct produces no change, nor does sub-threshold stimulation in conducting nerves.

20. Relationship of Na^+ Uptake and K^+ Rejection to Membrane Potential in Isolated Surviving Frog Skin.

Ernst G. Huf and Joyce Wills; *Medical College of Virginia.*

A negative correlation was found between net active uptake of NaCl by the epithelium and P.D. μE.g., skins that had P.D's of 30 and 100 mV respectively actively absorbed NaCl at an average rate of about 0.8 and 0.2 μEq x cm^{-2} x hr^{-1}. A positive correlation, however, was found between K^+ accumulation at the epithelial side and P.D. A skin of 30 mV, e.g., accumulated about 1 x 10^{-3} μEqk x cm^{-2} x hr^{-1}, whereas a skin of 100 mV accumulated about 14 x 10^{-2} μEqk x cm^{-2} x hr^{-1}. A large number of experiments suggests linear relationships between P.D. and NaCl uptake and also between P.D. and K^+ rejection. Skins of winter

frogs which were pretreated with a commercial purified ACTH preparation showed for any given P.D. a small net NaCl uptake as compared to controls, which were pretreated with inactive protein (egg albumin). The effect was greater in low voltage skins as compared to high voltage skins. K^+ rejection in experimental skins was the same as in control skins. Pretreatment of frogs with DOC, DOCA, Cpd's E and F had no noticeable effect on the correlations that exist among P.D., NaCl uptake, and K^+ rejection.

21. Experiments on the In Vitro Synthesis of Hemoglobin by Erythrocytes.

Lynn D. Abbott, Jr. and Mary Dodson; *Medical College of Virginia.*

Avian erythrocytes have been shown to incorporate N^{15} from labelled glycine into hemin which can be isolated from red cells after incubation with N^{15} glycine (Shemin, London, and Rittenberg). In the present experiments chicken blood was used in this way as an *in vitro* biological system to explore possible factors which might influence hemoglobin synthesis. Adenosinetriphosphate (ATP) did not increase the incorporation of N^{15} into heme in our experiments, in fact, the N^{15} concentration of hemin in every instance was less than that of blood incubated at the same time but without ATP. No increase was observed with tyrosine, leucine, uracil, riboflavin or fructose. 0.07 M NaF inhibited the synthesis. Folinic acid-SF or vitamin B_{12} did not increase the incorporation of N^{15} into heme. Slight increases were noted during incubation with sodium folate. Human cord blood was found to incorporate N^{15} from glycine into heme, in contrast to normal adult human blood which did not. Although the blood of a sicklemia patient with 26% reticulocytes incorporated N^{15} into heme, the blood of a pernicious anemia patient with 26% reticulocytes (at height of hematologic response to vitamin B_{12}) did not. Consequently, presence of a high percentage of reticulocytes does not appear to be the whole answer to the *in vitro* synthesis of heme by human blood cells. A human blood containing a high percentage of normoblasts did not incorporate N^{15} into heme.

22. Invasion of Tadpole Tissues by Balantidium as Recorded by Cinephotomicrography.

Carl C. Speidel; *University of Virginia.*

Motion picture shown by Dr. Kindred in absence of Dr. Cpeidel.

BUSINESS MEETING

The following officers were elected at the annual business meeting:

Chairman—Ernst G. Huf

Secretary—Desmond R. H. Gourley

Minutes of the Section of Psychology [10]

A. W. HURD, *Chairman*

STANLEY B. WILLIAMS, *Secretary-Treasurer*

FRANK W. FINGER, *Executive Committeeman*

RICHARD H. HENNAMAN, *Section Editor* (1954)

FRIDAY, MAY 16—9:00 A. M.—COFFEE SHOP

1. The Human Operator Factor in the Operation of Communication Systems.

   Howard Reuben; *University of Virginia.*

2. Day-to-Day Variability in the Serial Patterning of Psychological Responses.

   Willard F. Day; *University of Virginia.*

3. An Experimental Test of the Concept "Response of Discriminating."

   W. H. Morse; *University of Virginia.*

4. The Effect of Previous Experience and Recent Food Deprivation on Hoarding in the Rat.

   James G. Holland; *University of Virginia.*

5. Analysis of the Conditions Determining Interference in Complex Discriminative Motor Performance.

   A. J. Slivinske; *University of Virginia.*

6. Cutaneous Beats from Combined Electrical and Mechanical Vibratory Stimulation.

   Jack A. Vernon; *University of Virginia.*

7. Similarities of Content of Rorschach Responses of Husbands and Wives.

   Austin E. Grigg; *University of Richmond.*

   An analysis of the responses of 35 married couples to the Rorschach Test reveals certain similarities of content. Similarities of responses

between mates is compared with similarities of responses between nonmates. From analysis of the Rorschach, conclusions are made as to whether or not the similar responses reflect similar personality traits or reflect memories from similar experiences. The content of the Rorschach is found to fall into three categories: (1) responses based on personality variables, (2) responses based on memory traces of certain experiences not necessarily connected with personality traits, as scenes recalled from travel, books read, *etc.*, and (3) responses which seem to be too nebulous for interpretative significance at the present state of knowledge of projective theory. The significance of identical verbalizations is also explored.

8. Negro and White Childrens' Adjustment as Revealed by a Comparison of Their Drawings.

Emanuel F. Hammer; *Lynchburg State Colony.* (read by Hannah Davis.)

The relative degree of emotional disturbance between Negro and white school children was investigated by obtaining 400 sets of drawings (of a House-Tree-Person) from these two groups of school children who ranged from first to eighth grade. Three psychologists rated the childrens' adjustment level, as revealed by this projective technique, on a six point scale from "very well adjusted" to "psychotic." The Negro children were found to show a statistically significant greater incidence of emotional disturbance than the white children. This was taken to account, in part, for the relatively lower Negro mean IQ which was also found. Other differences between the two groups included indications suggestive of a higher incidence of organic cerebral cortex lesions, greater difficulties in interpersonal relationships, greater amounts of home stress and conflicts, and greater feelings of inadequacy about obtaining gratification from the environment on the part of the Negro children when compared with the white. Secondary problems, such as (1) correlation between clinicians' judgments and (2) interpretation of projective techniques of subjects with different cultural backgrounds, were treated or discussed.

9. The Effects of External Therapeutic Environment on Patient Behavior.

William A. Zielonka; *McGuire V. A. Hospital.*

A comparison is made of the effects each of three physical environments of psychotherapeutic meetings has upon responses of patients in the first three interviews of client centered therapy. The environments investigated are (1) a face-to-face situation; (2) the patient on a couch and the therapist out of the patient's sight; (3) both patient and therapist seated near each other but visually separated by an opaque screen. The data are restricted to the typed verbatim transcripts, and the results are based on an analysis of this material. The population consisted of twelve hospitalized neurotic males. There are two general conclusions. First, each sub-group of patients expressed the same relationship be-

havior with the therapist in each of the external environments. Second, the patients' expressions of attitudes varied with changes in the environment.

10. Psychometric Test Performance in Differential Classification of Neurotic and Psychotic Sub-Groups.

Reuben S. Horlick; *Alexandria, Virginia.*

This research concerns itself with whether psychological tests can distinguish between sub-groups falling within a major psychiatric classification. Twenty-eight anxiety and 10 depressive neurotic patients and 14 simple and 18 paranoid schizophrenic patients were tested with the Wechsler-Bellevue and Shipley-Hartford Scales, the Minnesota Multiphasic Personality Inventory, and the Rorschach Ink-Blot Test. On the Wechsler-Bellevue, the depressive group performed consistently better than the anxiety patients; the paranoid group was superior in all areas except for a reversal trend on the Picture Arrangement test. The MMPI scale differences are not significant for the neurotics; except for a significant difference at the five-percent level on the Masculinity-Femininity Scale, differences are not reliable for the schizophrenics. The Rorschach fails to differentiate either group. No one test or sub-test or scale reliably differentiates one sub-group from the other. While no one test proves to be infallible in its diagnostic ability, each test contributes valuable information for diagnosis and evaluation.

11. The Fourth Category of Personality Needs.

John A. Blake; *Central State Hospital.*

On the basis of ample clinical and general observational evidence, it is proposed that a fourth category of personality needs—in reality a single new need—be added to the existing categories, *i.e.*, the biological, social, and psychological. This newly proposed personality need may properly be designated the *spiritual* need which, however, must be considered in the widest sense as referring to man's "faith" in some variety of superhuman "power", either personalized or non-personalized, depending upon the particular culture and religion within whose spheres of influence he happened to be born and reared. Since Psychiatry, in its branch of Pastoral Psychiatry, does recognize and treat the spiritual maladies of the human personality, it is therefore strongly urged that Clinical Psychology also begin to take cognizance of, and deal adequately with, this highly important area of man's psychobiologically integrated personality.

12. A Follow-up Study of Guessing Behavior.

Burton R. Wolin; *College of William and Mary.*

13. Some Comments on Theory Construction in Physiological Psychology.

John K. Bare; *College of William and Mary.*

14. Major Steps in Food-Product Acceptance Research.

James A. Bayton; *Howard University and the Bureau of Agricultural Economics, U. S. D. A.*

The three major steps in food-product acceptance research are: (1) discrimination experiments to insure that in subsequent steps consumers are judging items they can readily detect as being different, (2) preference tests conducted on the items that are mutually distinguishable, (3) market tests to determine degree of market success of a new product. Comprehensive research programs of this type carry the psychologist into psychophysics, experimental design and opinion surveys. Cooperation with producers, economists, marketing specialists, food chemists, *etc.*, is necessary. Projects illustrating methodology at each step are described. The products involved are canned orange juice, frozen concentrated lemonade and frozen concentrated apple juice.

15. Four Negativistic Phases in Man's Life.

V. J. Bieliauskas; *Richmond Professional Institute.*

Negativism is understood by some authors as a normal feature of child's social development. Other authors have attempted to understand the negativism not as a part of child's development, but as integral part of the total development of man (Masselson, S. Hall, C. H. Stratz). K. Schmeing began to see negativism as a repetitive fact in man's life, so that he speaks not about one, but about three negativisms. Bieliauskas has introduced a tentative description even of the fourth negativistic phase, so that at the present we would expect negativistic reactions at the following ages: I. 3-4; II. 11-13; III. 21-23; IV. 35-45. Apparently the positive meaning of these phases can be found in the fact that they represent how an individual tries to reach his independence, to improve his ego-structure, to strengthen his self-feeling, and to mature. However, in addition to this, these phases show some significant physical and psychic changes following them. A survey of phenomena following consistently the negativistic phases show that: (1) The negativistic "phases" serve as introductory steps to certain physical and psychic periods of individuals development and that they are rather parts of phases than phases themselves; (2) All those phases introduced by the negativism show obvious analogy of characteristics; (3) These characteristics are typical for adolescence. Therefore the question is legitimate as to whether or not we have the right to speak about adolescence as a definite single phase. Possibly the presumption concerning "multiple adolescence" advanced by Schmeing and this author merits further consideration.

BUSINESS MEETING

FRIDAY, MAY 16, 1952—COFFEE SHOP, 2:00 P. M.

The business meeting was opened by the Chairman, A. W. Hurd, at 2:00 P. M., with approximately 35 members present.

The Nominating Committee of John K. Bare, Frank A. Geldard, and Minor Wine Thomas, Chairman, made a two-fold report: (a) the committee nominated the following for officers for the coming year:

President—Stanley B. Williams
Secretary-Treasurer—L. Starling Reid
Executive Committeeman—William Hinton

(b) the committee also recommended that nominations be made from the floor. No nominations were from the floor and the above officers were elected without dissenting vote.

After a recommendation from the floor that our representative to the Conference of State Psychological Associations be continued in office over several years, it was voted without dissent that henceforth the representative be appointed by the executive committee rather than elected by the membership.

After much discussion regarding the status of the Psychology Section as a part of the Academy and its additional function as a State psychological association, it was voted without dissent to direct the Executive Committee to investigate the feasibility of establishing a Virginia Psychological Association and to report its findings to the membership at or before the next annual meeting.

The Secretary reported a membership of 79 plus 8 student affiliates. He also estimated secretarial expenses at $20 to $25 per year unreimbursed.

The Treasurer reported receipts of $257.50 and disbursements of $254.00, leaving $3.50, which balance represents one dues payment in advance. Of the disbursements, $216.00 went to the Academy treasury and $38.00 to the Conference of State Psychological Associations.

Dr. Hinton moved that whereas John Buck had long served the Section and the Academy and the best interests of psychology in Virginia, especially during his years as Secretary-Treasurer and President of the Section, and that whereas John Buck had recently retired from active work because of ill health, that the members of the Psychology Section now acknowledge their gratitude to Mr. Buck for his faithful service and their deepest appreciation for his many constructive efforts in behalf of our profession, and further, that a copy of this statement be sent to Mr. Buck. After being seconded, the motion was carried unanimously and enthusiastically.

Business meeting adjourned at 2.50 p. m.

Minutes of the Section of Science Teachers [11]

SUSIE V. FLOYD, *Chairman*

THOMAS H. CHRISTIE, *Chairman-Elect*

MARTHA W. DUKE, *Secretary*

L. W. JARMAN, *Section Editor* (1954)

FRIDAY, MAY 16, 1952—9:00 A. M., HOTEL CHAMBERLIN

The meeting was called to order by the chairman in Parlor D. An invitation was extended to all members to visit a floating laboratory ship, The Maury, which was anchored at a near-by pier. Satisfaction was expressed over the half-day meeting so that members could attend the afternoon lectures in their own field of work. More than forty members attended the meeting. The following papers were presented:

1. Caverns as Teaching Material in General Science in Secondary Schools.

   Mrs. Thelma C. Heatwole; *Wilson Memorial High School, Fishersville.*

A. Introduction of Caverns to Students
   a) By use of folk-lore of specific region—the history of John Lewis, the founder of Staunton, whose daughter was kidnapped by the Indians and held captive in a cave.
B. Study Procedure:
   a) Use of films and library material
   b) Study of Theory of Cavern Formation
   c) Study of Chemistry of Formations.
C. Field Trip Procedures:
   a) Safety precautions discussed
   b) Screening of students for claustrophobes
   c) Plans made for field trip on which each student had such assigned jobs as measuring elevations and ceiling heights, making direction readings from a compass, taking pictures of formations, mapping the water courses, recording humidity, temperature, and barometric pressure, collecting specimens for determination of drip rate, or for microscopic study, sketching in evidence of feeder passages, cross passages, nest holes, ripple furrows, and breakthroughs to lower levels.
   d) Pooling of information in laboratory, and testing specimens
   e) Mathematical calculation to determine age of cave.
D. Further cave exploration with students who exhibited a real interest. Exploration done in un-developed caves.
E. Introduction of Virginia Womble, a student who had done an essay on Cavern Formation for the National Science Talent Search, and whose exhibit on Caverns was on display at the meeting.

2. Caverns as Teaching Material in College.

Marcellus H. Stow; *Washington and Lee University.*

The student beginning a college course in geology usually has some previous knowledge of biology, chemistry, and physics, but probably has never heard of geology. Hence, a special effort must be made to acquaint him with the significance of this new subject, not only as a basic science, but also as a part of the everyday life of man.

Field study and illustration of geological principles is of paramount pedagogical importance, and in fact, field trips are the most popular aspects of a course in elementary geology. Of the many types of trips, the one to a cave is the most favored. A small non-commercial cave about one half mile from the campus has served for many years as an ideal site for demonstration of the geological work of underground water. Here the processes and results of erosion, transportation, and deposition by underground water may be studied under circumstances that are novel and intriguing to the student.

Annually four groups of between thirty and forty freshmen are taken through a few narrow passages leading to the first large room. Here the group is assembled and a lecture is conducted based on clearly observable activity of underground water. Various precautions to be taken when exploring caves are discussed and a summary of these is distributed. The group is then escorted to the surface, the roll is taken, and the class dismissed.

The paper presented herewith was illustrated by Kodachrome slides showing typical features of the cave discussed during the lecture below ground.

3. Virginia Fisheries Laboratory Aids in Developing the Teaching of Biology.

Robert S. Bailey; *Virginia Fisheries Laboratory, Gloucester Point.*

An important function of science teachers is to arouse the capacity for scientific investigation lying dormant in many students. This can best be done by arousing the curiosity of the student through the contagious enthusiasm of the teacher. Curiosity is best aroused by introducing pupils to local fauna.

Teachers need knowledge of these local organisms. They also need materials to supplement standard texts. The V. F. L. can assist teachers in these ways:

1. Summer school courses with credit.
2. Supplementary materials
   (a) Exhibits
   (b) Printed and mimeographed matter.
3. Trips to the laboratory with lectures, field trips and movies.
4. The Public Exhibit Room.

Teachers should request the services of the Laboratory.

4. Science Offerings and Teaching Combinations of Science Teachers in the High Schools in Virginia.

Percy Holmes Warren; *Madison College.*

This study presents data concerning the science offerings and the science teaching combinations found in the high schools of Virginia in the years 1946-47, 1949-50, and 1951-52.

The data suggest unmistakably that science teachers in Virginia should have a broad preparation in science. More than 95 per cent of the high schools offer general science and more than fifty per cent of the teachers who teach one or more classes in science teach this subject. To teach general science effectively one should have competence in astronomy, biology, chemistry, geography, geology, meteorology, and physics. Science teachers should also be prepared to teach courses in biology, chemistry, geography, and physics.

The data further revealed that less than 20 per cent of the high schools in Virginia offer instruction in physics. This seems to be a serious shortcoming in light of the importance of physics in contemporary living. Moreover, it seems that more high school pupils with special aptitude in science should be given an opportunity to study physics with a view to exploring the vocational possibilities in this field.

Minutes of the Section of Statistics [12]

J. W. YOUDEN, *Chairman*

LIONEL WEISS, *Vice-Chairman*

M. E. TERRY, *Secretary*

W. A. HENDRICKS, *Section Editor* (1954)

FRIDAY, MAY 16,—9:00 A. M.—PARLOR C

1. The Treatment of Apparently Anomalous Observations.

Churchill Eisenhart; *National Bureau of Standards.*

A definition of a direct-measurement process is given, and the concepts of limiting mean, precision, true value, accuracy, systematic, and random errors reviewed. A philosophy of measurement processing is evolved. Considerations bearing directly on the problem of "rejection of observations" are emphasized, and by way of illustration a number of different "rejection" procedures are discussed in some detail.

2. Statistics in Motion and Time Research, I.

Fujio Umibe; *Virginia Polytechnic Institute.*

Research by the Industrial Engineering Department at Virginia Polytechnic Institute was undertaken in 1950 into the problems of the validity of certain parts of the standard time system known as Methods-Time Measurement. These parts of the system included the case in which the hand motions are aided by gross body motions, as when the hand is moved to the floor, aided by a bend of the body. The study was conducted by the use of micro-motion analysis, a technique which utilizes motion-picture films of various operations, projected in special frame-by-frame projectors. Due to the high initial cost of taking pictures, it was desired to gain as much information from each film as possible. An investigation by Mr. Alfred York had demonstrated that the present manner of classification of these motions by the Methods-Time Measurement system led to large differences between calculated and observed times. The problem then resolved into one of finding the variables which most affect the motions, and the best classification of these variables to meet the requirements of theory and practice. It was desired to use the available films for this extension of the problem.

3. Statistics in Motion and Time Study Research, II.

Hale Sweeny; *Virginia Polytechnic Institute.*

It was felt that the classification which met the requirements of practical use and yielded minimum error variance would be the "best" practical classification. To determine the variables which enter into the problem, data from the motion picture analysis was fitted into two 2^2 x

3 x 4 Factorial Designs, and analyzed in the standard manner. The results showed that certain variables could be eliminated, and certain interactions should be included in the classification. Regression analysis into the problem of classification is at present under way, using the information gained from the analysis of the Factorial Designs. The application of the statistical procedures to the problems of Motion and Time Study, with the many inherent variables, coupled with the large variability between humans, has aided to a great degree the recovery of information from data from other experiments, and in the successful completion of the research project as a whole.

4. Design of an Investigation in Philology.

A. M. Myster; *Virginia State College.*

The purpose of this paper is to present a progress report of an attempt to design an experiment in philology. Some statistical problems involved are pointed out and suggestions of solutions to these problems are made.

5. Methods of Sampling the Botanical Species in Forage Mixtures.

R. E. Blaser (Presented by Richard P. Bartlett); *Virginia Polytechnic Institute.*

Research investigations with forage crops almost invariably involves mixed species (grass, legumes, and weeds) in the sward. Since species respond differentially to natural and imposed environmental factors, it is necessary to obtain critical data on botanical composition of the sward.

In this study four samplers and three methods of estimating the percentage composition of birdsfoot trefoil in various mixtures were tried. The percent birdsfoot trefoil was estimated in (1) the standing herbage before it was cut, (2) the grain herbage after it was raked up, and (3) the dried herbage after it was removed from the oven. The four estimators were classified as (1) very experienced, (2) experienced, (3) little experience, and (4) no experience. Two sub-samples of the cut herbage were taken to the laboratory for making hand separates to obtain actual data on the percentage of trefoil in the mixture. This technique of making the actual separates gave very precise data.

Correlations for the methods of making the estimates for each of the four samplers were made with the actual hand separates. The very experienced and experienced samplers were highly correlated with the separates, whereas the inexperienced and slightly experienced samplers did not obtain reliable data.

6. Bias and Efficiency of Certain Sampling Methods.

C. Y. Kramer and T. J. Smith; *Virginia Polytechnic Institute.*

In this study two methods of estimating stand yield of alfalfa were tried. Method I consisted of cutting the stand, separating the foreign matter, weighing the stand green, and then adjusting each plot green weight to dry weight by its moisture coefficient. Method II consisted of cutting the stand, separating the foreign matter, weighing the stand

green, and then adjusting each plot green weight to dry weight by the average of twelve moisture coefficients taken at random from the plots. Both these results were compared with the actual dry weight of each stand.

First, an analysis was done on the yield of both methods. The mean square error and coefficient of variation were smaller for Method I. Second, an analysis was done on the biases. Method I had a negative mean bias and a smaller mean square error than Method II. Third, correlation coefficients were determined using the actual dry weight and both the estimates. Both of the correlation coefficients were highly significant. Fourth, a simple regression equation was found for each method. The intercept for Method I was considerably smaller than for Method II. A multiple regression analysis was then done so we could statistically compare the two methods.

7. Teaching Elementary Statistics.

Discussants: A. M. Myster, *Virginia State College;* L. Weiss, *University of Virginia;* T. S. Russell, *Virginia Polytechnic Institute;* W. J. Youden, *National Bureau of Standards;* M. E. Terry, *Virginia Polytechnic Institute.*

8. On Testing One Composite Hypothesis Against Another.

L. Weiss; *University of Virginia.*

Given two finite sets of density functions for the vector chance quantity $\mathbf{X}$: $(f_1(x), \ldots, f_k(x))$ and $(g_1(x), \ldots, g_l(x))$. $H(f)$ is the hypothesis that the true density function of $\mathbf{X}$ is in the first set, $H(g)$ is the hypothesis that it is in the second set. Under mild restrictions on the loss functions, it is shown that the set of decision rules:

$$\text{Accept } H(f) \text{ if and only if } \sum_{i=1}^{k} a_i f_i(x) \qquad \sum_{j=1}^{l} b_j g_j(x)$$

(where the a's and b's are constants) is essentially complete. When one or both sets of densities contains an infinite number of densities, sets of decision rules of the above type are, under certain restrictions, Σ-complete.

If it is desired to use only regions of acceptance for $H(f)$ such that if $\mathbf{X}$ is in the region, so is $T(X)$, where T is a given set of transformations, then under certain conditions the set of decision rules:

$$\text{Accept } H(f) \text{ if and only } \sum_{i=1}^{k} A_i \bar{f}_i(x) \qquad \sum B_j \bar{g}_j(x)$$

(where the A's and B's are constants) is essentially complete. $\bar{f}_i(x)$ and $\bar{g}_j(x)$ are derived from $f_i(x)$ and $g_j(x)$ respectively by a straightforward process which is too long to describe in this abstract.

9. Sampling of Mice Populations.

R. A. Bradley; *Virginia Polytechnic Institute.*

Method of estimation of biological populations are considered both with regard to precision and bias. Such methods have largely been developed for the estimation of size of fish populations. In the present paper an attempt was made to use the procedures for the estimation of population sizes of pine mice in small orchard blocks. The numerical analysis is shown and both theoretical and practical difficulties are discussed. One of the principal aims of the discussion is to point out the need of further research on this subject. Data used were taken from experimentation by Frank Horsfall, Jr.

10. Multiple Regression with a Quantal Response.

D. B. Duncan and R. C. Rhodes; *Virginia Polytechnic Institute.*

The problem considered is that of fitting a maximum likelihood multiple regression equation to data in which the response is quantal, the probit transformation is appropriate and the number, r, of independent regression variates is not small.

Iterative methods, for example the Bliss-Fisher method, are available but these have been developed mainly for the case $r=1$ and rapidly become impractical for cases $r>2$.

A method is developed based on (i) the approximation of the weighted deviations of the working probits from the provisional probits by linear functions of the provisional probits and (ii) the replacement of the independent x variates throughout most of the procedure by a linear function of them, termed a composite regression variate. These devices lead to a simple procedure and result in an estimated 70 to 90% saving in work.

11. Multiple Regression with a Polychotomous Criterion.

D. B. Duncan and R. E. Schneider; *Virginia Polytechnic Institute.*

We consider the problem of fitting a multiple regression equation to data in which the criterion consists of an ordered set of grades. For example, the responses of insects to various doses of an insecticide applied with varying times of exposures and temperatures may be classified as dead; moribund; affected, but recovered; and unaffected. A model is developed which transforms the probabilities, P_{tl}, that an observation will occur within the first t grades into probits Y_{tl}. The model then relates the probits to the independent regression variables by the linear function

$$Y_{tl} = b_{0t} + b_1 x_{1l} + \ldots + b_r x_{rl}$$

in which only the intercept varies with respect to t. An appropriate method of analysis is developed and illustrated with an example.

12. Prediction of Extreme Values.

Julius Lieblein; *National Bureau of Standards.*

This paper presents an approach to estimation of the parameters of the extreme-value distribution $F(x) = \text{Prob}\left\{ X \leq x \right\} = \exp\left(e^{-(x-u)/\beta}\right)$ by means of linear function of order statistics, $T = \sum_{i=1}^{n} w_i x_i$, where $x_1 < x_2 < \ldots < x_n$ are the order statistics in a random sample of size n from F(x). Two desirable properties of such estimators are unbiasedness and minimum variance (from among such estimators). These two properties uniquely determine the n weights w_i from the means, variance and covariances of the x_i. The means have previously been tabulated. Explicit formulas which have been found permit simple numerical computation of the variances and covariances from tabulated functions alone. Estimators based on these are constructed for sample of $n<6$, larger samples being handled by breaking up into subgroups of 5 or less. This method is found to have the following advantages over existing methods based on mean and standard deviation of an entire sample: (1) the estimators are unbiased; (2) in many cases the estimators have greater efficiency; (3) breaking sample into subgroups allows possibility of checking whether data are random and come from assumed type of distribution. (This work was sponsored by the National Advisory Committee for Aeronautics.)

13. The Moving Range between Groups as a Control Chart Statistic.

M. E. Terry; *Virginia Polytechnic Institute.*

When the Shewhart model is not valid because it is known that batch to batch variation exists, the usual limits placed on $\bar{x}$ are too tight. Correct limits can be found using the successive differences of sample means as ranges of two. In addition to plotting $\bar{x}$ and R, it is suggested that the successive difference be plotted also, as a measure of the batch to batch variation.

An example of the utility of the method was furnished by Eastman Kodak Company.

14. Balanced Incomplete Design Used As a Means of Determining the Acceptability of Seven Types of Clothing Fabrics.

Elie Weeks; *The Quartermaster Board, Fort Lee.*

The continuing wool shortage has intensified the search for suitable substitutes for use in making uniforms. The Research and Development Division, Office of The Quartermaster General, directed the Quartermaster Board to conduct an acceptability test of seven fabrics made up into officers' summer uniforms. The fabrics ranged from 100 per cent

wool through part wool and part synthetic to 100 per cent synthetic. A balanced incomplete block design of test was used in testing the fabrics. This study was conducted at two test sites: Fort Bliss at El Paso, Texas (Hot Dry); and Fort Lee, Virginia (Warm Humid). The 112 test subjects at each site were issued two uniforms to be worn alternately for two day periods. The normal wear period lasted approximately ninety days. Data were generated through the use of questionnaires and by examination of the tested uniforms. Analysis of the data included use of a method of rank analysis of variance developed by Dr. D. B. Duncan, member of the staff of the Statistical Laboratory at Virginia Polytechnic Institute.

15. The Use of a Constant Approximate Inverse Matrix in Weighted Least Squares Iterations.

David B. Duncan; *Virginia Polytechnic Institute.*

Weighted least squares solutions can be accomplished by adding the product CG to an initial approximate solution, C being the inverse of the matrix of weighted sums of products and G the vector comprising the weighted sums of products of the regression variates with the errors of estimate given by the approximate solution.

If C is replaced by an approximation C" the correct solution may be obtained by iterations using the solutions of each step to provide the initial solution for the next. The closer the approximation C", the fewer will be the iterations required.

In certain maximum likelihood estimates problems, for example, in probit analysis, an iterative solution is used in any case because the weights and hence C changes for each solution. Much time is spent in recomputing C at each step, whereas from the above observation it is clear that a constant approximation C" may be used for all steps. The result is a large decrease in the work for each step, an increase in the number of steps required, and an overall decrease in total effort.

Also advantages may accrue in a wide range of problems on replacing C by an approximation of simpler form.

16. New Designs and Techniques for Organoleptic Testing—The Rank Analysis of Incomplete Block Designs—I.

R. A. Bradley and M. E. Terry; *Virginia Polytechnic Institute.*

A summary of the work on the rank analysis of incomplete blocks is presented. Particular reference is made to applications in the field of sensory difference testing and consideration of basic threshold taste sensations. This report combines the material of two papers to be published soon. One will appear in Food Technology, July 1952, and the other in Biometrika, December, 1952.

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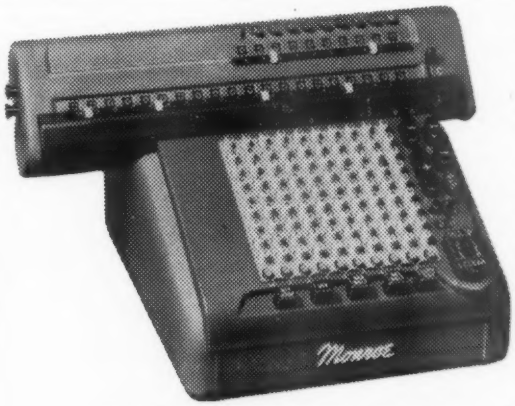

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